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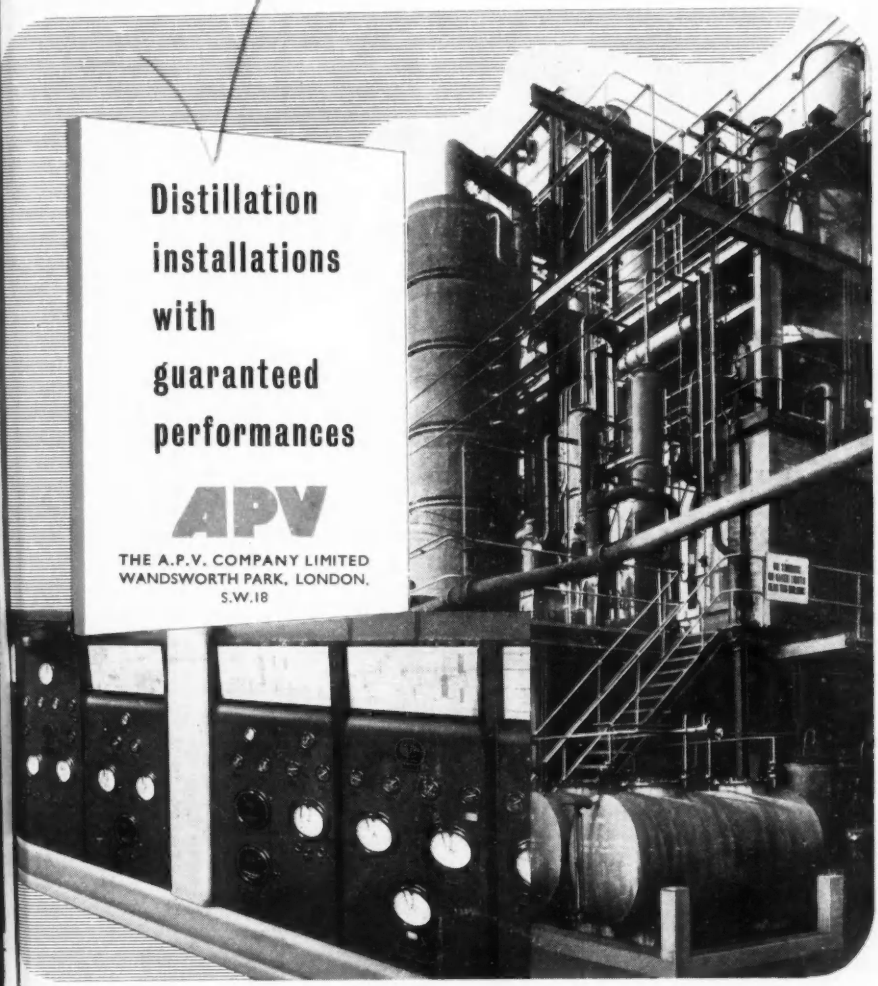

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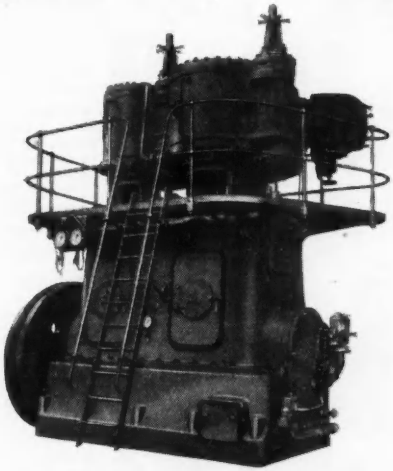

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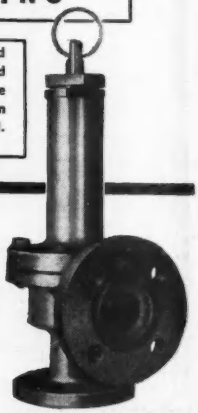

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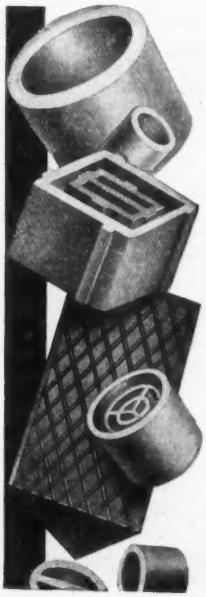

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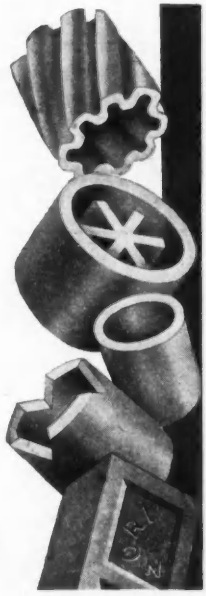

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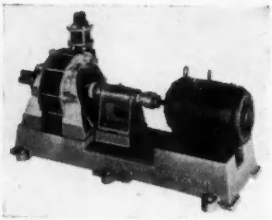

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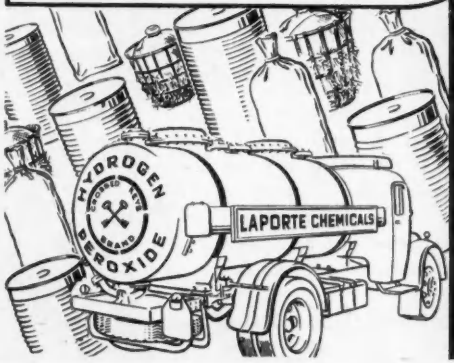

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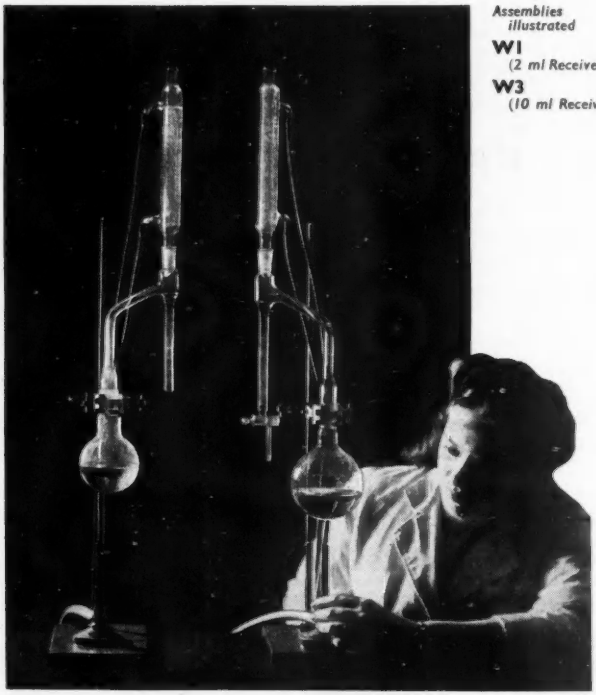

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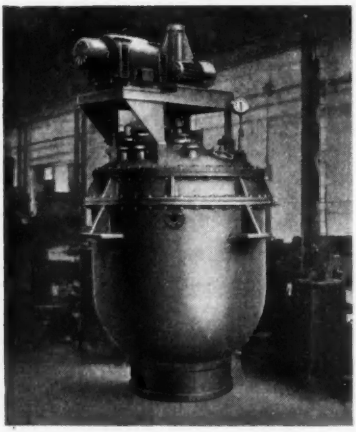

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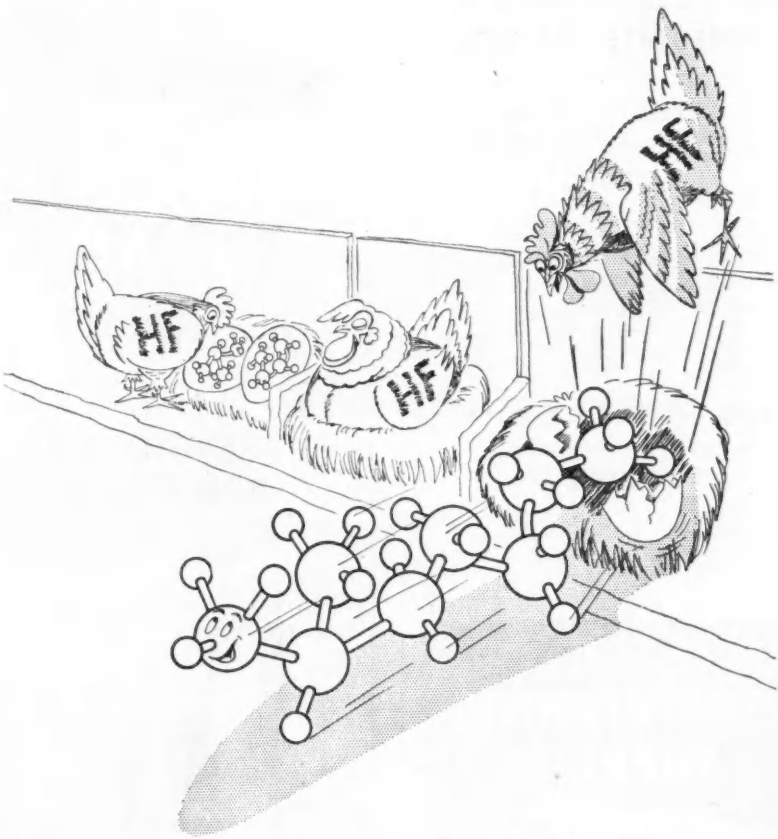

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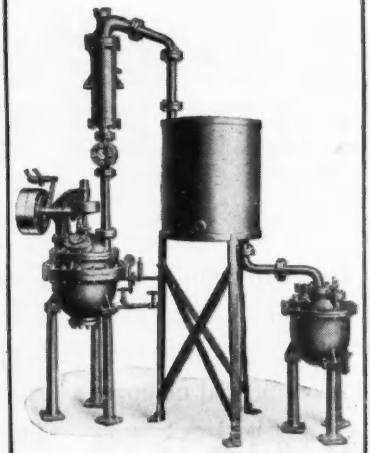

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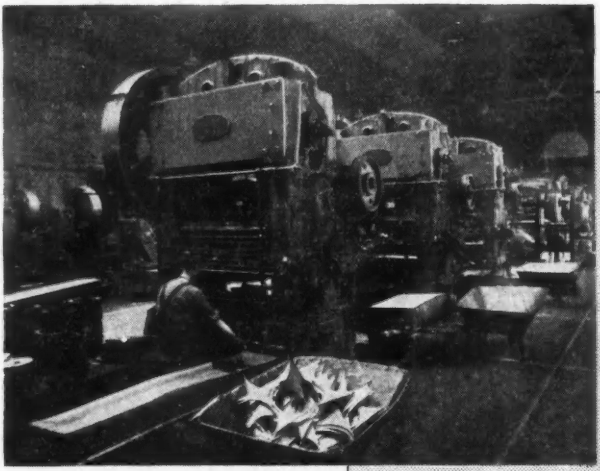
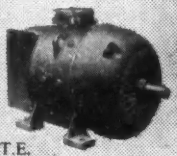


A.C. squirrel-cage induction motor (die-cast frame)



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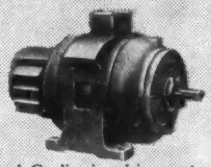
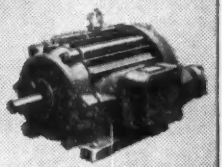
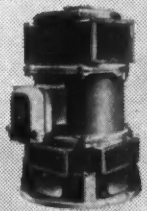


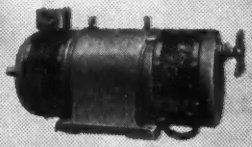
A.C. slip-ring drip-proof motor.



T.E. fan-cooled squirrel-cage flameproof motor.



Vertical spindle slip-ring induction motor



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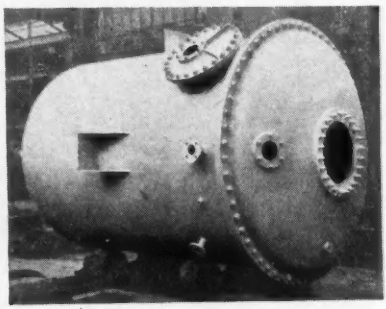

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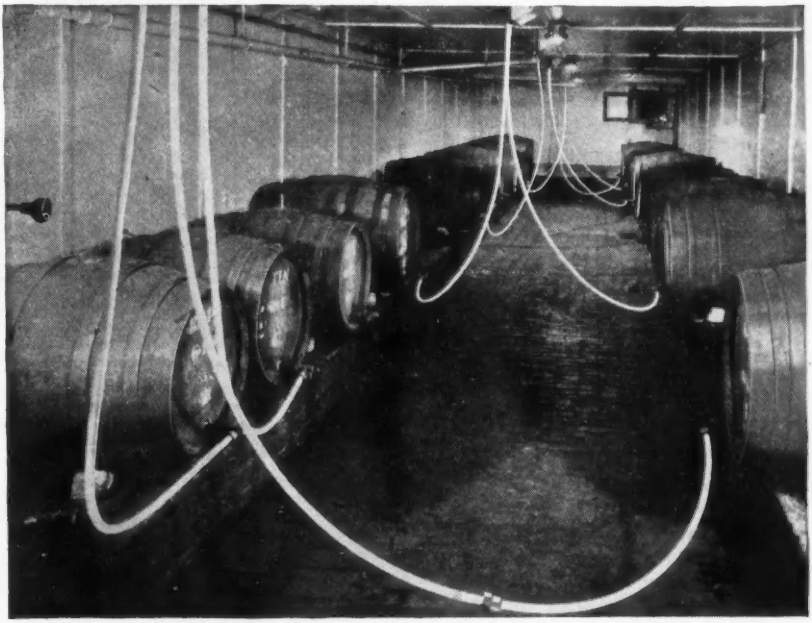

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P.368

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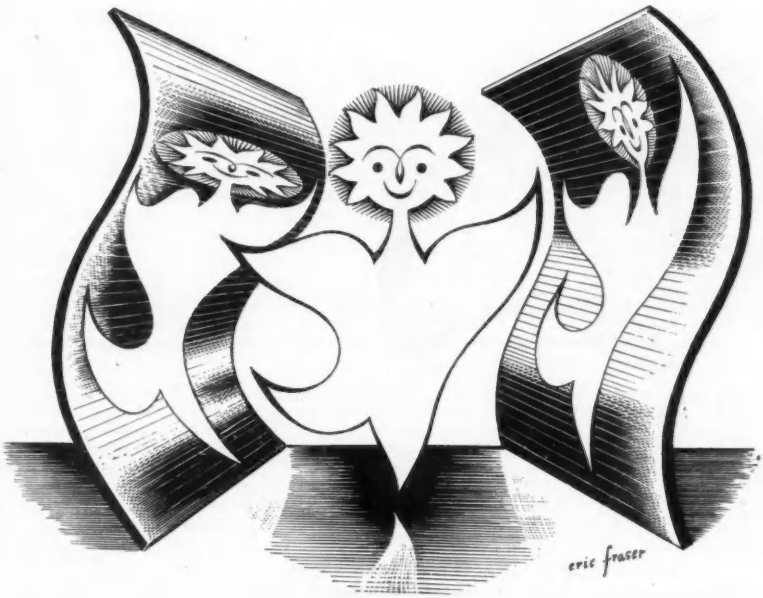

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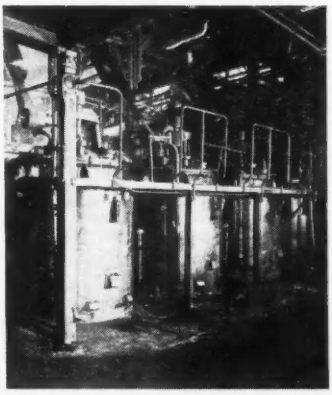

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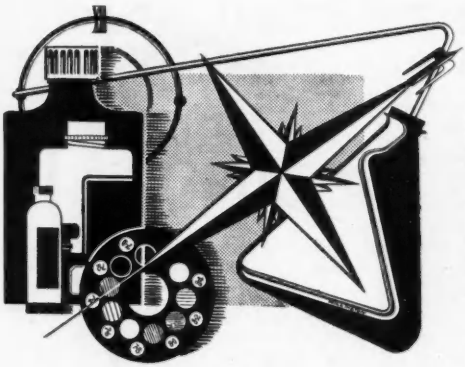

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The
Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

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Simplification and Productivity

THE frequent inducements to look closely at American ways in commerce and production will be uniquely increased as a result of the meetings to be held in London next week, organised by the Incorporated Sales Managers' Association. The primary objective of these is to gain an intimate picture, presented by experts, of the technique which the U.S.A. has evolved to make the fullest use of long run, low-cost production. That is the principle which probably contributes as fully as anything else to the competitiveness of American manufactured goods in world markets. Much of this is enshrined in the terms "simplification" and "standardisation." It permits the continuous maintenance of turnovers on a scale not often approached here and it cannot be satisfactorily employed without them. How that is sustained in the U.S.A. will be told in London by leading American sales managers —described by Mr. Paul Hoffman as "an extraordinarily competent group of men"—and their advice to their British counterparts on the integration of sales and production planning on a grand scale could materially improve our prospects of closing the "dollar gap."

While all the common practices of American sales management are not fit to be adopted here *en bloc*, there has grown up in the U.S.A. a custom whose wider adoption here could scarcely fail to result in important improvements in productivity. That is the liberal exchange of technical knowledge, even between apparent competitors, and occasionally the sharing of production facilities. It has to be admitted that this principle has made little headway here. The secretiveness which the Atomic Energy Research Establishment strives to preserve sometimes finds a counterpart, somewhat grotesquely, in the policy of commercial undertakings. That, one may hope, is one of the things which the London conference will serve to discourage.

Standardisation for large-scale sales programmes most obviously demands a much greater degree of collaboration among the two groups, manufacturers and users, than has yet been seen; and engineering equipment represents one of the most evidently promising fields for it. The absence of machinery for collecting and making known the technical requirements and points of view of users of engineering equipment and supplies has been underlined by the Lemon Committee. It was able, however, to point to two promising

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attempts by user groups to encourage standardisation of their common equipment. The sponsors were the petroleum and chemical industries. The evidence of this was the recent registration of the Engineering Equipment Users' Association, formed by five of the leading industrial groups in the chemical and petroleum industries, all of whom have some needs in common for certain engineering equipment and stores.

It is noteworthy that both the chemical and petroleum equipment industries have had direct contact with the British Standards Institution through their BSI technical committees. Thus the association starts off with an intimate knowledge of the requirements and problems of standardisation.

The new organisation will provide its members with a means of exchanging information on standardisation of the materials and equipment common to most of them. Panels of experts are being appointed to indicate where and how standardisation can be most usefully applied, and the substance of their reports will be placed before the British Standards Institution.

Although membership of this new group numbers only five, an obvious advantage in the initial stage, the plan is, of course, intended to benefit all who use the particular types of equipment. Later, it is expected, they too will be consulted. Collaboration should not be difficult to achieve; users and manufacturers both stand to benefit by standardisation and simplification, leading to a reduction of the number of types of equipment and stores and so to lower costs of production. Judged by this criterion alone, the new association appears as a timely development, which is capable of rendering good service in the current rapid expansion of the chemical and petroleum industries.

It will be strange, however, if the association does not ultimately look beyond the sphere of standardisation. The opportunities for the exchange of other vital forms of information, such as experience gained in the current creation of large production units obviously provides, should be too profitable to be neglected. In the light of the Lemon Committee's report, it is probably true, however, that the lead which the Engineering Equipment Users' Association has given to others who still have no means of presenting their co-ordinated views on standardisation may be its most far-reaching result.

Notes and Comments

After M-Aid

WHEN the attempt to forecast the shape of industrial affairs in Western Europe, and Great Britain in particular, after Marshall Aid has ended next year tends to magnify the inevitable sense of uncertainty, an effective antidote is to stand back and take a remoter view—from the standpoint of American industry. An exceptional opportunity of becoming acquainted with a stimulating view of Western Europe's chances in the field of industrial chemicals is offered in the course of the 27th annual review by *Chemical Engineering* (57, 128-130) of the state of American chemical industries. Even making allowance for the fact that this responsible American journal is at pains not to paint too rosy a picture of the future of American chemicals in world markets, it is apparent that the success of the numerous enterprises to broaden the basis of chemical production here is not doubted in the U.S.A. Chemical industries there are being warned to expect not merely curtailment of a substantial part of their accustomed sales to the new producing countries, but competition in the "neutral" markets and even at home.

Forecasts of British Expansion

THE expert American opinion, based largely upon the summaries and estimates of the Chemical Products Committee of OEEC, singles out the re-invigorated fertilisers, plastics and dyestuffs industries as potentially formidable competitors. The United Kingdom, according to this, is cast for a dominating rôle in relation to plastics and dyestuffs supplies in 1952-53. In that year British production of platics raw materials is expected to make available 45,000 metric tons of phenolics (27,700 in 1947), the same quantity of amino resins and 33,500 metric tons of vinyl resins (compared with 6500 in 1947). The figures are substantially larger than the forecasts for any other European countries which the report surveys. Expected production of other types of British plastics material in 1952, 52,500 metric tons, is almost twice as large as any other country's, the probable runner up being France (29,400 metric tons). American industry is told to expect British dyestuffs in the same year to reach a possible total of 52,000 metric tons (34,000 in 1947) and to provide 20,000 metric tons for export. "It is reasonable to assume," concludes the *Chemical Engineering* report, "that the United States will lose a substantial portion of its chemical export markets and, with the continued reduction in tariff barriers, may even face competition in its domestic markets." These figures, while no more than estimates, can scarcely fail to have a bearing on such things as U.S. tariff policy and the ECA programme. The report, however, disclaims responsibility for drawing any such conclusions.

An Antibiotic Landmark ?

CHEMISTS with an appreciation of the historical aspects of their subject might now jot down in their diaries "subtilin, 1950." With very little publicity, antibiotics have entered a new field. Penicillin, streptomycin, aureomycin, chloromycetin, and bacitracin have all helped the doctors; subtilin is a new antibiotic substance that promises to help food processors by destroying food-decaying bacteria. The submerged culture technique can be used in producing subtilin, which is derived from *Bacillus subtilis*, a strain of bacteria of fairly wide occurrence in nature. At the moment, subtilin's possibilities have been demonstrated only on a research laboratory scale by workers at the Western Regional Research Laboratory, Albany, California. Long-term tests must be undertaken before any commercial use of subtilin as a preservative can safely be permitted, but there are encouraging

indications in the facts that additions of subtilin to the diet of rats during several months produced no harmful consequences, and even a large dose appeared to have no ill effects on a rabbit. The preservative action is not complete. Tests with canned vegetable foodstuffs have shown that minute additions of subtilin reduce the time period and temperature required for effective canning. For peas, corn and asparagus a pasteurisation at 212° F. for periods from 5 to 20 minutes could replace the customary 30 minute or longer treatment at 240° F. While some pasteurisation seems still required to destroy the heat-sensitive decay organisms of foodstuffs, the addition of subtilin may well be sufficient to deal with the more troublesome heat-resistant spore-forming organisms. From one to five parts per million of subtilin will exercise complete inhibition of those decay organisms for which it is specifically antibacterial. The economic prospects are obviously attractive.

Realism in Physics

THAT physicists are likely to be very practical people, even when they have been immersed in the rarefied atmosphere which surrounds nuclear fission, received new evidence in the lucid and down-to-earth submission to the Royal Society of Arts by Professor M. Oliphant of current achievement and nearer possibilities of atomic fisson (pp.*369-372, this issue*). Further proof that physicists are coming increasingly to grips with problems especially in instrumentation, upon whose solution a good deal of industrial chemical expansion depends has been given in cordial terms by Dr. N. P. Inglis to physicists visiting the Billingham centre of I.C.I., Ltd. Birmingham University's professor of physics is stimulatingly explicit when dealing with the nebulous subject of atomic energy and its most likely sources and has the uncommon gift of reducing some abstractions to common terms. He is explicit about two points which recent statements have not greatly clarified. He says: "I would emphasise that industrial atomic power from uranium is on the doostep and will almost certainly be used successfully, while power from hydrogen is only a remote possibility in the light of existing knowledge." He is in no doubt that the initiative in deciding whether atomic power shall fulfill its promise or be perverted to destroy civilisation has passed to mankind at large, with some deeply sorrowful results for responsible scientists. "There is danger in all knowledge of nature. Scientific information can always yield guns as well as butter," he says.

Milestone in Metallurgy

METALLURGISTS in many parts of the world, particularly Great Britain and France, next month will be celebrating the anniversary of the birth 100 years ago of one whose inquiring spirit created entirely new prospects for the iron and steel industry. This was the young police court clerk, Sidney Gilchrist Thomas, who, working in his spare time, solved the metallurgical problem of the dephosphorisation of pig iron, which made possible the use of deposits of phosphoric iron ore previously thought to be useless. Thomas, son of an Inland Revenue officer, was born in London on April 16, 1850. The death of his father when Thomas was seventeen caused him to abandon his hope of a professional career, and thrust upon him the rôle of recorder, first at Marlborough Street, then at the Thames Police Court. He found sufficient time to take up the study of chemistry and physics, and it was the observation of a lecturer at Birkbeck College which first turned his attention to the pig iron problem. The centenary will be officially commemorated by the Iron and Steel Institute on April 26, when no doubt the story will be told of his association with his cousin, Percy Carlisle Gilchrist, and others who helped to develop the process, the success of which lay to a large extent in lining the melting furnaces with the mineral dolomite. No country benefited more from Thomas's work than France, where he died—in Paris, at the early age of 34.

I.C.I.'s U.S. PROJECT

Bid for Control of Rhode Island Co.

IMPERIAL Chemical Industries, Ltd., has made an offer to acquire a controlling interest in Arnold, Hoffman & Co., Inc., chemical manufacturers, of Providence, Rhode Island, U.S.A. If the offer is accepted, I.C.I. will acquire an interest in the manufacture of dyestuffs and other synthetic chemical products in the United States and a medium through which its dyestuffs and auxiliary products, made in the U.K., can be readily marketed in the U.S.A.

Arnold, Hoffman & Co. Inc., has an issued capital of $930,000 consisting of 93,000 common shares at a par value of $10, the price offered by I.C.I. being $55 per share. The American Corporation operates three plants—at Charlotte (North Carolina), Cincinnati (Ohio), and Dighton (Massachusetts), and is engaged in the manufacture of a variety of chemical products including dyestuffs, plasticisers, printing gums, sulphonated oils, synthetic resins and wetting agents.

The finance required, says an I.C.I. statement this week, will be provided by bank loans in New York, and the transaction will not, therefore, involve the use of any of Britain's dollar resources. The transaction, which has been approved by the United Kingdom Exchange Control authorities, is expected to result in a substantial increase in the flow of dollar earnings to Great Britain.

Comment from independent sources foresees that the transaction may involve an investment of $3.5 million. I.C.I. would probably require an interest if not much less than 70 per cent of the issued capital of the American company.

The latter is one of the oldest industrial chemical undertakings in the U.S.A., having been established in 1815 and incorporated in 1900. Its sales in 1948 produced over $7 million and there was a net profit of $218,584. The year before, the company obtained, as a loan, $600,000 which is being repaid in equal instalments over a period of 12 years.

Mr. Stanley Chambers and Mr. J. L. S. Steel are reported to be the I.C.I. directors largely responsible for the company's negotiations to obtain control of Arnold, Hoffman & Co., Inc. Mr. Chambers, who recently joined the board, was previously chief of the Finance Division of the Control Commission in Germany.

NEW U.S. OIL POLICY

No More ECA Aid for Refineries

A REFUSAL to finance further British overseas expansion of oil refining industry was disclosed in the text of a report on crude oil and petroleum products and equipment under ERP, given this week by Mr. Paul Hoffman, administrator of the ECA, and Dr. Oscar Bransky, chief of the petroleum branch, ECA, to a U.S. Congress sub-committee on petroleum.

Referring to British claims for the need to expand oil production, Dr. Bransky said the British had always insisted that their expansion programme was not excessive and was designed to meet only their commercial market needs.

Oil interests in Britain had maintained that the use of current surpluses to displace American oil from the sterling area, Argentina, Sweden, Norway, Denmark, Finland, Spain and Portugal, was only temporary.

ECA refused, however, to finance any of this overseas expansion—some $80 million (£28,571,000) had been requested in the fiscal year 1949—pending better information on the overall expansion programme.

The ECA was withholding the further financing of British company projects anywhere, until the outcome of the talks in which the State Department were also taking part.

Approval of aid was not to be withdrawn, Dr. Bransky said, for the two refineries in the United Kingdom financed by ECA, or for the two on the Continent in which British companies had an interest.

ECA estimated that in 1951 European countries would spend about $700 million on crude oil, refined products and equipment, representing about 23 per cent of their $3100 million deficit.

Electronic Torch Melts Tungsten

A NEW electronic torch capable of melting firebrick and even tungsten (at 3370°C.) has been developed by Dr. J. D. Cobine, at the (U.S.) General Electric research laboratory, Schenectady, New York. No method has as yet been devised for measuring the temperature of the flame, produced by passing nitrogen through an arc of extremely high frequency radio waves. The waves break up nitrogen molecules into individual atoms. When these reunite heat is released. No industrial uses have yet been indicated.

STATUS OF TECHNOLOGY

Segregation Would be Illogical

THAT pure and applied science must be stable companions in any well-designed technical curriculum, was the view expressed by Sir James Peck, former Permanent Secretary of the Scottish Education Department in his address to the annual meeting last week of the Former Students' Association of the Royal Technical College, Glasgow.

He said that the dividing line between pure and applied science must at times be a little vague and there must always be a spill-over. Nevertheless, a broad distinction did exist between knowledge for its own sake, and the application of knowledge to the needs of man.

"I would not put technology in the position of the poor relation, or the servant to these high-browed masters," said Sir James. "Rather I would claim that both are activities of the ingenious mind of man equal in prestige though different in kind.

One suggestion, said Sir James, was to let the colleges take over the whole business and become technical institutes of university rank, self-contained and self-sufficient.

But what did that lead to in logic? Were the other faculties to follow suit, and so provide one university for arts, another for medicine, one for law, and so on?

That would no doubt result in greater manageability and a narrow specialised efficiency, but what would become of the old idea of a university serving its region in all subjects of repute?

Training Technologists

THE establishment of three new post-graduate schools in applied mechanics, physical metallurgy and mining, at Sheffield University was announced last week.

Cost of the scheme, which it is hoped will ensure a steady flow of fully trained technologists to industry, will be about £20,000 a year, and the first students are expected to be enrolled in October.

Practical experience in a works where he could apply his learning was essential for the university man to become a fully trained technologist, said Dr. A. W. Chapman, registrar of Sheffield University. What had become appreciated only recently was that, after a few years in industry, a man could benefit greatly from a further study of the most advanced aspects of his particular technology.

SELLING TO U.S.A.

Sales Planning and Management

"SALES Planning for Dollar Markets" is the subject of an Anglo-American conference, organised by the Incorporated Sales Managers' Association and the (U.S.) National Sales Executives, to be held in London on March 13 and 14.

The first task of the conference, which will be attended by a team of American sales managers, is to give their British counterparts a working knowledge of American sales practices. A comparison of American methods, in which the emphasis is on volume sales, can then be made with British methods which are, generally, more selective. The Americans hope to be able to suggest ways of making British industries more price competitive by world standards to provide a freer flow of exports to all countries.

The U.S. team includes Mr. R. A. Whitney, president, National Sales Executive and Mr. D. Mitchell, president, Sylvania Electric Products, Inc.

Technical Literature Exhibition

TO have attained an international reputation as one of the principal scientific journals in a brief eight years is a unique achievement.

This is the success of *Endeavour*, the quarterly review published by I.C.I. in English, French, German, Italian and Spanish, of which 30,000 copies of each issue are distributed free to specialists.

An exhibition devoted to this magazine and the many other forms of technical literature produced by I.C.I. is now on view in the exhibition hall of the Academy Cinema, Oxford Street, London, W.1, until March 17. Every year some 800 new books and brochures are published, ranging from four-page leaflets to standard reference works of several hundred pages. Examples of these, produced by various divisions of the company, are attractively displayed.

International Microchemistry

THE first International Microchemical Congress, to be held in Graz, Austria, from July 2-5, under the auspices of the Austrian Society for Microchemistry, is to include celebrations of the anniversaries of the death of Emich and Pregl, who pioneered the development of microchemical techniques in Graz. Lectures will cover the whole field of microchemistry.

The congress secretary is H. Malissa, Schögelgasse 9, Graz.

THE FUTURE OF STEEL

The Government's Intentions

THE first challenge to the Government's nationalisation policy since Parliament reassembled was issued by Mr. Anthony Eden in the House of Commons when he spoke for the Opposition following the Address on the King's speech.

There could be no argument, said Mr. Eden, that there had been a pretty emphatic vote in the election against nationalisation. The country wanted no more nationalisation, no more socialisation, and no more mutualisation—a singularly ugly word which ill concealed its ugly purpose.

In the view of the Opposition, that went for iron and steel also. He trusted that the Government had accepted that verdict in the same way as they had accepted the verdict to shelve all other nationalisation measures.

The Prime Minister, Mr. Clement Attlee, stating the case for the Government, said that it had been stated quite clearly in the gracious Speech that where it was necessary to introduce measures, even though they were contentious, the Government would not hesitate to do so.

"I was asked a question on the position of the Iron and Steel Act," continued the Prime Minister. "That Act is on the Statute Book. The corporation cannot be appointed until October 1, 1950. The earliest date for vesting is January 1, 1951.

"There is nothing to be done in the matter immediately, but that statute is on the Statute Book and our purpose is to give effect to Acts passed by Parliament."

An amendment to the Address, bringing the issue into the scheme of debate was promptly tabled in the names of Mr. Winston Churchill, Mr. Oliver Lyttelton, Mr. Harold Macmillan and Mr. R. A. Butler. It read:

"...But humbly regret that the gracious Speech contains no reference to the future of the iron and steel industry and that in a time of rising world competition this vital industry will be kept in a state of anxiety and suspense."

The subject was raised in firmer terms in the House on Tuesday when Mr. Churchill said the Opposition would be willing not to press the matter to a division if the Government would give a declaration that the vesting date should be not less than nine months after the next general election.

Mr. Herbert Morrison, replying, said that if the vote came, the Government would be ready to meet it. He described as "quaint" the idea that nothing should be done about steel nationalisation until another general election in order that the industry should be left in security and certainty. He considered it would have the reverse effect.

(continued at foot of next column)

FEBRUARY OUTPUT

All Steel Records Broken

STEEL production in Britain in February again reached a new record, output for the month being equivalent to an annual rate of 16,898,000 tons.

This total exceeded by 490,000 tons the previous highest rate established in May, 1949, and was over one million tons greater than the January output.

Pig iron production was at an annual rate of 9,588,000, an increase of 166,000 tons compared with a year ago.

Detailed figures for the first two months of this year and last year were as follows:

STEEL INGOTS AND CASTINGS
(Thousands of Tons)

	1950		1949	
	Weekly average	Annual rate	Weekly average	Annual rate
January ...	305.3	15,873	288.5	15,002
February ...	325.0	16,898	311.1	16,176
PIG IRON				
January ...	187.4	9,742	178.1	9,262
February ...	184.4	9,588	181.2	9,422

Production rates in Scotland and Wales also set up new records. Scottish output reached an annual production rate of 2,632,400 tons, which was 44,300 tons more than the previous best total, established in March last year.

The figure for South Wales was 3,493,000 tons, an increase of 200,000 tons over the output for February, 1949.

Industrial Oils: New Price Structure

THE Minister of Food announces that during the four-week period ending April 1 the following alterations will be effective in the prices of unrefined oils (all prices being per ton naked, *ex* works):—

Linseed oil from £126 to £132; linseed oil foots from £76 to £82; castor oil firsts from £98 to £115; castor oil seconds from £91 to £108; whale oil No. 3 grade from £99 to £85; whale oil No. 4 grade from £91 to £75; whale oil/herring acid oil from £58 to £70; whale acid oil, hardened, from £93 to £90; mixed sunflower and whale acid oil from £58 to £70.

The prices of all other unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users will remain unchanged.

PRODUCTION AND STOCKS OF N-F METALS

Generally Increased Production in January

CONSIDERABLE increase of production in all groups of non-ferrous metals was noticeable in January compared with the same period of 1949. This is shown by the monthly figures issued by the British Bureau of Non-Ferrous Metal Statistics.

While imports remained fairly steady, there was a decline in exports except in the case of tin metal. Government and consumers' stocks were better than a year ago, except those of lead.

UNWROUGHT COPPER

	Long Tons	
	Blister Copper	Refined Copper
OPENING STOCKS		
Govt. and consumers' ...	46,796	82,878
Imports	6,602	19,308
PRODUCTION :		
Primary	—	12,682
Secondary	2,237*	5,689
CONSUMPTION :		
Primary	12,832	25,086
Secondary	—	16,887
Exports	2,637†	45
CLOSING STOCKS :		
Govt. and consumers' ...	40,402	89,798

*Rough Copper.

† Includes 431 tons of rough copper despatched to Belgium and 2206 tons of rough copper to Germany for refining on toll.

GROSS OUTPUT OF MAIN COPPER, ALLOY AND PRODUCTS

Unalloyed copper products	24,402 long tons
Alloyed copper products	25,031 " "
Copper sulphate	4,019 " "

UNWROUGHT ZINC

	Long Tons	
	Zinc in Concentrates (estimated gross Zinc content)	Slab Zinc (all grades)
OPENING STOCKS :		
Govt. and consumers'	37,026	61,570
Imports	2,654	7,199
PRODUCTION :		
Virgin and remelted ...	—	5,607
CONSUMPTION :		
Virgin (incl. debased)	6,712	19,229
Remelted and scrap	—	8,035*
Exports and Re-export	—	11
CLOSING STOCKS :		
Govt. and consumers'	32,968	54,145

* Includes small quantity of zinc in concentrates consumed directly for chemicals, etc.

LEAD

	Long Tons			
	Lead in Concentrates	Imported Virgin Lead	English Refined	Lead Content of secondary Scrap and Residues
OPENING STOCKS :				
Govt. and consumers' ...	—	48,875	2,524	—
Other stocks ...	80	—	—	—
IMPORTS ...	—	21,081	—	229
PRODUCTION ...	214	—	5,324	—
CONSUMPTION ...	235	14,782	4,657	8,501
Exports	—	16	—	—
CLOSING STOCKS :				
Govt. and consumers' ...	—	—	—	—
Other stocks ...	59	—	—	—

TIN METAL

	Long tons
GOVT. AND CONSUMERS' STOCKS (at end of period)	15,941*
IMPORTS	50
PRODUCTION	—
CONSUMPTION	1,830
EXPORTS AND RE-EXPORTS	471

* Amended figures to represent Government's stocks wherever located.

ANTIMONY

	Long Tons
TOTAL CONSUMPTION OF ANTIMONY METAL AND COMPOUNDS	443
TOTAL CONSUMPTION OF ANTIMONY IN SCRAP	336

CADMIUM

	Long Tons
TOTAL CONSUMPTION OF CADMIUM	59.35

LETTER TO THE EDITOR

Need for Chemical Traders

SIR,—I am instructed by my Council to refer to the "Report on the Chemical Industry, 1949," prepared by the Association of British Chemical Manufacturers at the request of the President of the Board of Trade, and to register a strong protest against the statements embodied in Chapter 13, one of which reads:—

"There is thus little room in the home market for ordinary merchant selling, and in fact merchants occupy a small place in the industry."

This statement is not only misleading and inaccurate, but is without foundation, since it is a well established fact that merchants have played, and continue to play, an important part in the development of markets for the chemical industry both at home and abroad.

It is to be deplored that my association was not consulted before statements detrimental to the British chemical trade in general, and to chemical merchants in particular, were published.—Yours, etc.,

F. G. W. PAIGE,
General Manager and Secretary,
THE BRITISH CHEMICAL & DYESTUFFS TRADERS' ASSOCIATION.
Coronation House,
4 Lloyd's Avenue, London, E.C.3.
March 2, 1950.

TOXIC AGRICULTURAL CHEMICALS

Were Essential Precautions Too Quickly Relaxed?

From A CORRESPONDENT

ONE of the outstanding advances of applied science in recent years has been the development in new insecticides and weedkillers, and the rapid expansion in their use.

In any valuation of the great benefits they have conferred—by the increase of food supplies—it is not possible to exclude the fact that some of them stand indicted as potentially dangerous poisons bringing known and unknown risks to human life. A modern agricultural merchant's store, or the barn of a progressive farm or market-garden today may carry a stock of lethal substances far beyond the dreams of the Borgias.

It may be objected that this has always been true, in some degree. Arsenicals, nicotine products, salts of mercury, and sulphuric acid have been customary materials of trade for some time. In practice, however, the poisonous or corrosive hazards of these established articles have long been well known and that knowledge has diminished the danger. The extreme example, potassium cyanide, which is also ocasionally used as an insecticidal fumigant, is the source of very few accidents.

It is impossible to make any poison child-proof, fool-proof, or incapable of being criminally misused. But new poisons carrying new risks present graver problems. It is in the interests of these chemicals and of their great benefits to food production that this aspect of their use calls for frank recognition.

Four Fatalities

Dr. Donald Hunter's Ernestine Henry Lecture to the Royal College of Physicians (*Brit. Med. Journal*, March 4, 1950) calls attention to the fact that the spraying of solutions of DNOC (3: 5-dinitro-*ortho*-cresol), now extensively used as a weed-killer, has caused the deaths of four agricultural workers in this country, and a number of other deaths in Germany, Hungary, France, the United States, India, and Africa. "Most spray operators lose weight during the DNOC spraying season . . . There is good evidence that DNOC is a cumulative poison . . . DNOC is absorbed through the skin by ingestion or by inhalation of dust, spray, or vapour . . ." These are precise statements of the toxic risks associated with spraying diluted DNOC.

Deaths have also occurred in the manufacture of DNOC, but here it may fairly be argued that it should be possible to impose and maintain effective safety measures; the risk is centred at one place and for one small community of workers, and it can be publicised and the fullest safeguards can be set up. It is clearly a different and much more difficult problem when the material reaches the various farming areas to be used by a wide variety of workers.

To quote Dr. Hunter again: "Spray operators must be warned that they are handling a dangerous substance . . . Routine medical examination of all DNOC workers should be made at weekly intervals. Men showing the early toxic symptoms—namely, excessive thirst, sweating, and loss of weight—should be suspended from work, since there is no way of telling in which individual severe intoxication and even death may result."

Little Control

Such measures can be exercised rigorously in a factory; they cannot with any certainty be enforced when small gangs of men work unsupervised in the field. A recent book on weedkillers, a well-known work newly revised, in describing DNOC and its use, made no mention of the associated toxic danger. On the contrary, a comparative safety was implied.

Another class of agricultural materials newly introduced is the organo-phosphorus group of insecticides, Parathion, TEPP, and HETP. Dr. Hunter observes that these are from three to five times as poisonous as nicotine. "All types of preparation penetrate rapidly through the skin, producing only slight irritation at the site of absorption. Exposure to as little as 0.3 g. daily has been estimated as dangerous to man."

TEPP and HETP, fortunately, hydrolyse rapidly on being mixed with water and this produces harmless substances; their safety from the point of view of crop residues is based upon this fact. Those who use these materials must, however, first handle them in their non-hydrolysed and concentrated form.

(*continued on page 368*)

THE PHYSICIST IN CHEMICAL INDUSTRY

Instrumentation at Billingham

by Dr. N. P. INGLIS *

IT was Lord Kelvin who said that if you wish to understand you must measure, and in our operations we accept this as axiomatic. Our flow, temperature, pressure analysis and other meters and instruments and the men who look after them are our technical accountants or watchdogs. They constitute the very guardians of our efficiency.

Even before the war, we felt that our use of instruments was at least somewhat above the average, but during recent years the degree of instrumentation has advanced almost spectacularly. Our chemists and engineers are much more instrument-minded and it is not unusual in a new chemical plant to find that the capital cost of the instrumentation is as high as 10 per cent of the total capital cost.

There has grown up a lack of content with the ordinary indicating instrument, which demanded that somebody should read and record it periodically. The demand is now firmly established for continuously recording instruments, not only because of their greater coverage of events and their greater freedom from the human element but also because they provide the gateway to automatic control of plant operations.

Obviously, if you have, say, a continuously recording temperature instrument it is elementary to follow up the thought that the impulse or force which actuates this continuous recording can be amplified if necessary and utilised to adjust a resistance or alter a valve whereby the temperature can be controlled.

Development of Instrumentation

While the accurate measurement and recording, and ultimately controlling of flow, temperature, and pressure are vital to us, the field of industrial instrumentation has now extended far beyond these. The continuous recording of gas and liquor analysis has been developed and you will see instruments in actual service which achieve this very thing. You will also see other instruments in course of development for the same and similar purposes.

* Director of the I.C.I. Metals Division, in a paper presented to members of the Physical Society during their visit to Billingham (THE CHEMICAL AGE, 62, 346).

Dr. N. P. Inglis

Having outlined very broadly the field of interest, let me tell you something of the people and organisation which we have to cultivate this field. First, we have an instrument research and development section, mainly staffed by physicists, but including one or two specialist engineers. This section is at the beck and call of our large research department, our factory officials and our engineering designers for all matters and problems associated with the development of new instruments or the radical improvement of existing instruments.

Some of the inquiries which we receive can, of course, be met by diverting the matter to one or other of our good friends in the instrument-making industry. Naturally, we avoid expending our efforts on matters which can be better dealt with by them.

There are, however, many inquiries and questions which concern special or novel instruments required for some purpose which is peculiar to ourselves. It would be unfair to divert the energies of the instrument firms towards such highly specialised and local jobs where, even in the limit, possibly only a very few instruments will be required.

Let me quote one or two special cases as examples. Three or four years ago a demand arose from our chemical research people for an instrument which would continuously record a very small rate of flow of a gas or liquid under pressure con-

ditions of 250 to 350 atmospheres. As a result of the subsequent research work done by our instrument research section, a recording rotameter was developed for this purpose and 30 or 40 of these instruments are now in effective use in our semi-technical and small scale plants.

The reliable existence of these instruments is making possible chemical research which simply could not be carried out had these instruments not been available. The instrument has applications for lower pressures and full details of the design, etc., have been published. Any instrument manufacturer can obtain a free licence, so that this development is now readily available to the whole of industry.

One other problem which came our way arises from the fact that at Billingham steam from our boiler plant is utilised for the generation of power in turbines and the steam at lower pressures is then used for a variety of purposes, including the operation of various engines and prime movers.

The boiler engineers very understandably require any condensate to be sent back to them as boiler feed water. They have found, however, that such condensate is often slightly contaminated by oil due to the purposes for which the steam has been used. They can tolerate an oil content of a few parts per million, but they wish to reject any condensate which contains more than this. They, therefore, asked for an instrument which would reliably and continuously record the number of parts per million of oil in the condensate. This presented us with a very nice little problem and the subsequent research and development was not without its headaches; but an instrument based on the measurement of fluorescence was evolved and has worked well.

Co-ordinated Layout

Our instrument design section has the prime responsibility for the design and lay-out of all instrument arrangements on the new plants which we construct or on the major modifications of existing plants. This work is not without its complexity because, in addition to ensuring that the right instruments are put in the right place, these designers are also responsible for the best and most economic arrangement of the network of piping, valves, electrical connections, etc., associated with such instrumentation.

We have progressed somewhat from the days when instruments were scattered round a plant rather like tops on a Christmas tree, and the tendency now is for centralised control rooms where the instruments and controls are grouped and the whole system is under the eye or one or two men.

I should also mention that the instrument designers are responsible also for the design in final form of instruments developed by our instrument research section. Naturally, the prototypes of these instruments may work very well indeed in the laboratory or even on the plant when under the loving care and kindly handling of a highly skilled physicist, but may require modification in order to make them more robust and foolproof. The instrument design section, which is learned in the ways of the ham-handed, plays an important part in converting the successful prototype into the Mark I instrument. An equally important part is played by an instrument workshops.

Instrument Servicing

While we are not instrument makers, it is essential that we should have a sound instrument workshops for the repair and maintenance of our instruments. The capital cost of much of our plant is so great that we cannot afford to have it idle or running inefficiently due to delays in repairing vital instruments. Our instrument workshops also make the special instruments which the instrument research and development section devise.

Last but by no means least you must all realise that it would be stupid to have a strong instrument research team and a strong instrument design team unless we had an equally strong band of people to watch over the instruments when they finally go into service. Each of our several works, therefore, has its instrument manager, who is usually a physicist. He does much more than merely maintain and calibrate the large number of instruments on his works, although this alone is quite a big task. He interprets and analyses the results which his instruments give and provides his works manager with data which determine the measured efficiency of the various steps in the processes carried out by the works. Moreover, he is continually assessing the need for additional or different instrumentation.

Aiding the Chemist

Another group of physicists studies the use of physical methods as aids in chemical research. Practically every physical technique has application in chemical research nowadays and the initial development of this application must be by physicists. They develop the application to a stage where it subsequently becomes a regular and day to day tool in the hands

of the chemist. There are quite a number of examples of this class of work and I would like to say a few words about the reasons why we are so deeply interested and concerned with them.

We have done a great deal of work in the field of absorption spectroscopy and absorption spectroscopes are now much used in our analytical work for a variety of purposes. Our first major interest in such spectroscopy methods was in the analysis of special aviation fuels; such fuels were one of our major pre-occupations during the war.

By the use of infra-ray or ultra-violet absorption spectroscopes we can carry out the analysis of these highly complex materials in a matter of a few hours, whereas ordinary chemical analysis would take a very skilled analyst at least a week. In fact, this technique has been so well developed and the methods have proved so extraordinarily useful that an infra-red spectrograph is now a routine analytical tool on our petrol plant.

Use has, of course, been made of emission spectroscopes. We have very strong metallurgical interests here because of our position as a user of a very large variety of special metals and alloys. The emission spectroscope has been used to a very large extent in the analysis of such special metals and alloys.

Our X-ray crystallographic work has been found a helpful tool in much of our chemical reseach, perhaps particularly so in our fundamental work on the structures and constitution of catalysts. The sister technique of electron diffraction is also available to us for problems such as catalysis and corrosion, which involve study of the surfaces of solids.

This same section has not been slow in turning to our advantage developments in the use of radioactive elements. Potassium salts are frequent constituents in many fertilisers. By measuring the amount of the radioactive potassium isotope we have a very ready means for measuring the potassium content of such fertilisers. Such determinations are now being made in a matter of minutes by means of Geiger counters; a similar analysis would take one or two days by ordinary chemical methods. Use of radioactive elements is also being made in our study of the action of fertilisers through their life cycle.

Our latest " pride and joy " is the mass spectrometer. This is not only an analytical tool capable of analysing extraordinarily complex mixtures, but it often reduces what would otherwise be a complex and intricate research to a mere analytical exercise. A typical case of this is the work which our physicists are doing to find out how a plant, fed with a nitrogenous fertiliser, varies in nitrogen or sulphate content throughout the different stages of its growth.

This work on the application of physical methods to chemical research is one of high intellectual stimulus to the physicist and offers him an amazingly rich field of endeavour.

TOXIC AGRICULTURAL CHEMICALS

(*continued from page* 365)

It is possible to buy small bottles from horticultural sundries shops without signature and it is questionable whether the warnings given on the outer container and inside label are adequately emphatic. They include these: " This substance is poisonous. The inhalation of its vapour, mist, spray, or dust may have harmful consequences. It may also be dangerous to let it come into contact with the skin or clothing; Prolonged contact with the skin should be avoided in the case of the concentrated solution."

This product is sold at 80 per cent strength. Despite its greater toxicity, it is sold to the public with less restrictions and precautionary emphasis than nicotine sulphate (for which the Poisons Register must be signed) or nicotine dusts and sprays, which contain only low percentages of nicotine.

Parathion is more stable than HETP and TEPP. Dr. Hunter reports that one senior scientist in America " died after spraying an orchard with parathion for approximately six hours—death occurred five hours after the onset of headache. Three deaths have occurred in men handling concentrated parathion in manufacture and compounding." However, no cases of poisoning from parathion or related compounds have been reported in Great Britain.

Although such observations as these about the newer insecticides and weed-killers have serious implications, it is almost inconceivable that the use of such extremely valuable agricultural chemicals should be discontinued. It is disquieting however, to learn that the toxic properties of some of these materials are still being investigated long after they have been put into fairly wide use. Traffic lights have three colours, red, amber and green. In the practical development of these materials, should there not be an amber waiting period?

Industrial Applications of Atomic Energy

Present Limiting Factors and Some Prospects

by Professor M. L. OLIPHANT, C.B.E., M.C.*

THE element uranium is the heaviest and most complex of the substances existing in the earth. Elements with more than 92 protons in the nucleus are too unstable to have survived since the earth cooled down about 3000 million years ago.

When a neutron is captured by one of the two isotopes of uranium, the transformations which take place differ from these occurring in other elements. The rarer isotope of mass 235 undergoes a process which is called fission, splitting into two large fragments which separate with great velocity, the energy released being about 10 million kWh for 1 lb. of U235 undergoing fission.

The U235 atom, after absorption of a neutron, splits into two atoms of simpler structure and smaller mass, which separate with high velocity, their energy being dissipated as heat in the surrounding atoms with which they collide. In addition, several neutrons are set free, and if the surrounding material is also U235, these neutrons will be absorbed and will produce several fresh fissions.

Thus it is clear that in a mass of U235 large enough to absorb the neutrons from a fission process taking place at the centre, a chain process can build up, and since the neutrons are moving with high velocity, the number of fission processes taking place multiplies with great rapidity.

A mass of U235 in which this chain process will just take place is said to be of critical size, and the greater the extent by which the mass exceeds the critical size, the more rapid is the multiplication, so that if the critical size is exceeded appreciably an atomic explosion takes place.

Simplest Reactor

The critical mass for U235 is officially stated to be between 2 and 400 lb., and since it is a very dense substance this corresponds with a sphere of metal less than 12 in. in diameter. Since the neutrons released with high velocity in the fission process are absorbed directly, a nuclear chain reaction of this type is called a fast fission process.

Professor Oliphant

If the mass of uranium 235 consists of two pieces, either of which alone is smaller than the critical mass, and these are brought together slowly and cautiously, it is possible to find a position where the system is so little above the critical size that the energy release builds up very slowly.

The two pieces of uranium metal will then be heated and we can arrange an automatic mechanism which pulls them apart if they get too hot or brings them together if they cool off, so maintaining them in a red-hot condition. The heat given off can be transferred to water or to gas and can be converted into useful power in a heat engine. This is the simplest type of nuclear reactor which can give useful power.

Slow Neutron Reactors

The capture of neutrons by the much more plentiful U238 prevents the establishment of a chain process with natural uranium. There is, however, an ingenious way out of this difficulty, which enables reacting systems to be built using natural uranium.

U238 does not capture neutrons which are moving with less than a certain minimum velocity. Neutrons can be slowed down by passage through materials like pure carbon or heavy water, which do not

* Representing part of the annual Trueman Wood Lecture, which Professor Oliphant, professor of Physics, University of Birmingham, and a pioneer of the atomic energy research, presented before the Royal Society of Arts in London on March 8.

absorb neutrons at all readily. The particles then make collisions with atoms of carbon or of heavy hydrogen, handing over to the struck atom at each collision a part of their energy.

By placing rods of uranium in a geometrical pattern, which can be calculated, in a mass of pure graphite, it is possible to arrange that fission neutrons, escaping from the relatively thin rods without appreciable absorption, wander round in the graphite for a considerable time, making many collisions and losing most of their velocity. When they do again wander into a uranium rod they are, in general, moving too slowly to be absorbed by the U238, and hence ignore it. However, they are very readily captured by the rarer U235 atoms, giving rise to fission.

Tonnage Quantities

In order that a chain reaction may be produced, a slow neutron reactor of this type must also be above a certain critical size, where the number of neutrons lost from the outer surface is less than the number generated within the pile by the chain reaction. The critical size is large and even a small slow-neutron reactor will contain many tons of uranium and hundreds of thousands of tons of carbon as pure graphite.

The many neutrons escaping from the outer surface are, to some extent, reflected back by a thick layer of graphite placed round the reactor, while the remainder, together with the accompanying X-rays, which are so harmful to living matter, must be absorbed in the walls of a massive concrete enclosure.

The energy set free in the fission process in the uranium rods appears as heat, which can be removed by passing gas or water over them. Here again it is necessary to coat the uranium with a protective layer of corrosion resistant metal which does not absorb neutrons readily, aluminium being employed at present in the absence of a better material.

The slow neutron reactor has some advantages over the fast neutron reactor, but it suffers also from severe limitations which are not present in the fast reactor. The large mass and surface of the uranium allows very large quantities of heat to be extracted, so that the total power output of a large reactor can be of the order of 1 million kW of heat.

However, it is not yet practicable to remove this heat at a temperature high enough for efficient heat engines to be operated from the steam or gas which carries away the energy. This is due to the limited corrosion resistance of aluminium. The development of coatings of beryllium, or the use of less reactive gases such as helium, for cooling, would permit the production of useful power, but no reactor is yet operating under these conditions.

There are also other grave difficulties due to changes in the properties of materials under the action of the fast neutrons. These technological problems will be solved, but they take time and great effort to achieve a completely satisfactory answer.

A far more serious problem is that in a slow neutron reactor it is possible to use only a small fraction of the U235 present in the rods. Inevitable impurities in the materials, and the accumulated products of fission, "poison" the reaction by absorbing neutrons. The former set a lower limit to the concentration of U235 in the rods at which the reactor will operate, and this is only slightly less than the concentration in natural uranium.

The uranium must be removed periodically and be subjected to an elaborate and costly chemical process involving solution of the rods in acid, chemical purification and reduction to metal again.

The whole of the initial chemical operations must be carried out by remote control in concrete or lead enclosures which absorb the harmful radiations coming from the highly radioactive fission products. These fission products, equivalent in activity to many tons of radium, must be disposed of in some way, and this is one of the most difficult problems of all. The radioactivity decays away in time, some of it relatively quickly, some much more slowly, so that if the fission products are stored in vats underground they will, in the course of a generation or two, become harmless. However, the storage capacity required to deal with the radioactive waste products of a large reactor is so huge that provision of the necessary underground vats becomes an immense undertaking.

All these difficulties are very real and must not be underestimated. However, they are technological difficulties with which modern applied science is accustomed to deal, and none of them is insuperable.

"Breeder" Reactors

The picture of the production of atomic energy for industrial purposes, so far, is not encouraging. The fast neutron reactors require rather concentrated fissile material as atomic fuel and this is very difficult and expensive to produce. The slow neutron reactors utilise only a very

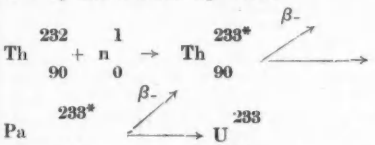
small fraction of the rarer isotope of uranium and produce about the same quantity of plutonium. Much more than this must be achieved if atomic energy is to compete successfully with coal as a source of power.

Fortunately the way out is clear, though it has not yet been achieved in practice, and the solution brings with it the possibility of using thorium, as well as uranium, as a nuclear fuel.

On the average, a fission process releases several neutrons, say three. If it is assumed that there are in the reactor no impurities or materials of construction, other than uranium, which absorb neutrons, the three fission neutrons can be utilised in the following way.

At constant power output, one of these neutrons must produce a fresh fission by absorption into the nucleus of another fissile atom. A second neutron can be captured by uranium of mass 238 to produce an atom of plutonium, thus replacing the atom of fuel which has been used. The third neutron can be absorbed by a second U238 atom, giving another plutonium atom. Thus a reactor operating in this way should produce more nuclear fuel than is burnt and is called a "breeding" reactor.

The breeding process should make it possible to utilise the whole of the uranium, the plentiful U238 as well as the scarce U235. If the excess neutrons are absorbed in thorium instead of U238, a new fissile material which can replace U235 or plutonium, is produced, by a process very similar to that which produces plutonium. We can represent this process by the nuclear equation:



The thorium nucleus absorbs a neutron-producing a radioactive isotope of thorium of mass 233. This emits a negative electron, or β-particle, transforming into a radioactive form of proto-actinium, which emits a further β-particle to give an isotope of uranium of mass 233. U233 is a fissile substance which can be used as a fuel in a nuclear reactor. Thus, in time, it should be possible to change over from uranium to the more plentiful thorium as fuel for the production of nuclear power.

The design of a successful breeding reactor depends upon the elimination from the reactor of materials which capture an appreciable fraction of the neutrons without contributing to the production of power or of fresh fissile material. There are reasons why this may prove to be more practicable with the fast neutron reactors than with those using slow neutrons, partly because the smaller mass of fissile material in the reactor can be prepared in a state of higher purity, partly because there is no moderator, but principally because the essential materials of mechanical construction and the cooling fluid which can be used in a fast neutron reactor are not so restricted in properties.

The most important of the factors to which answers have yet to be found is the extent to which the materials in the reactor retain their physical properties of strength, etc., when the atoms of which they consist are continually stirred up and knocked out of place by collisions with fast neutrons.

Experimental Programme in U.S.A.

The Atomic Energy Commission in the U.S.A. has announced the construction of two types of experimental breeding reactor and a materials-testing reactor. The first of these is designed to test the practical feasibility of breeding with fast neutrons and to investigate the application of liquid metals to the removal of fission-produced heat at high temperatures.

The second will produce significant amounts of electric power from a reactor using neutrons in the intermediate range of energies, and at the same time will determine whether breeding is possible under these conditions.

The heat will be removed with liquid metal and power will be generated from this by conventional means. These breeder reactors, together with the materials-testing reactor, are estimated to cost about $70 million. The Ministry of Supply has not yet announced plans in Britain for work on breeder reactors upon which the future of atomic energy for useful purposes clearly depends.

Economic Cost

It is not easy to estimate, as yet, the economic cost of nuclear power. The energy derived from 1 lb. of uranium, completely utilised in a breeder reactor, is equivalent to that produced by burning 1500 tons of coal. The cost of uranium is about 1000 times the cost of coal. This leaves a factor of about 3000 to cover the cost of converting the uranium to a form suitable for use in a reactor and the

greater cost of a nuclear reactor over a coal furnace. In the absence of precise data it is possible only to guess the ultimate answer.

You will find that many British scientists and engineers of repute believe that the cost will always be too great for atomic energy to compete with coal as a source of power, and that the new form of energy is purely of military and scientific interest. I do not share this view. I feel confident that atomic energy has a very important part to play in the production of industrial power and that the cost will ultimately be found to be competitive with, and probably much less than, the cost of power from other sources.

The time required to reach this stage of development is unlikely to be less than 10 to 15 years and clearly it depends on the relative efforts devoted to the military and industrial objectives. Uranium is more widespread in occurrence than was thought to be the case and, with the development of methods for extracting it from low-grade ores, there should be sufficient available to provide a great contribution to the power resources of the world if it is not used for the manufacture of military weapons.

Hydrogen as a Nuclear Fuel

Finally, we must consider the possibility that industrial power may one day be produced from hydrogen.

Long before the discovery of the fission process it was realised that under conditions of extremely high temperature and pressure, such as exist in the interior of the sun and stars, hydrogen nuclei, or protons, might combine together to give nuclei of heavier elements, and that because the component parts of heavier nuclei are very tightly bound together, sufficient energy would be released to maintain the temperature of the star.

If it were possible to find a method by which heavier atoms could be synthesised from hydrogen at will and under controlled conditions, very large amounts of energy would be available.

Thus, if four atoms of hydrogen condense to form an atom of helium the energy set free is about five million times as great as that produced when an atom of carbon is burnt. In other words, 1 lb. of hydrogen transformed into helium would produce about 100 million kWh of heat energy, or about 130 million horsepower for an hour. Thus hydrogen as nuclear fuel would be about 10 times as good, weight for weight, as uranium.

There are possible ways in which an explosive reaction of this type can be produced by utilising the very high temperature and pressures developed in the explosion of an atomic bomb, but so far there is no clue to a method for bringing about the reaction in a controllable way. However, it is interesting to speculate on the possibility that nuclear scientists may discover how to do this in the future.

There is enough hydrogen in the sea if it were all converted into helium, to raise the temperature of the whole earth to at least 1 million °C., *i.e.*, over one hundred times the temperature of the surface of the sun. Fortunately for us, the possibility of bringing about such an explosion can be ruled out, if for no other reason than that if it were possible it would have happened in the past history of the earth.

However, if we accept as the desirable power level for civilisation that every individual should utilise, on the average, 1 kW of power continuously, we can calculate that 3000 million inhabitants of the earth could be supplied with power from the hydrogen of the sea for 1000 million years, or for about a million times the age of the earth itself. Thus, if this remote possibility is realised, mankind would have no need to look elsewhere than to the sea for all the power he can conceivably use in the lifetime of the solar system.

Progress of Liverpool Cyclotron

CONSTRUCTION of the synchro-cyclotron which will form the centre-piece of the new premises for the physics department of Liverpool University is making good progress. Installation of the 1600-ton high grade steel electro-magnet has already begun, but the synchro-cyclotron, claimed to be the largest outside the United States, will not be in operation for two years.

The new machine is 156 in. in diameter, while that at Harwell, at present the most powerful in Britain, has a diameter of 110 in. The synchro-cyclotron will be operated by remote control.

Temporary laboratories are already in occupation, and it is expected that research work will begin this month when a high tension generator is installed.

Cheaper Fission Products

Resulting from extended production facilities, at Oak Ridge, Tennessee, the U.S. Atomic Energy Commission has instituted considerable cuts in the price of uranium fission products for research and industry—radioactive iodine from $1 to 75 c. per millicurie, radiostrontium and radiobarium from $1.85 to $1 and 13 others are proportionately reduced.

CORROSION AND EROSION OF PUMPS

Effects of Resistant Materials and Design

by NORMAN TETLOW, B.Sc., M.I.Mech.E.*

CORROSION is naturally a major factor for consideration when selecting constructional materials for pumps employed in the chemical industry.

The only really reliable guide where corrosion complications are known to exist is experience. Laboratory tests designed to indicate the resistance of any particular material to attack are unfortunately not always to be relied upon.

It is unlikely, for instance, that laboratory tests would indicate the suitability of cast-iron pumps for handling 60 per cent sulphuric acid at 100°F.; but these are widely used for this duty in the sulphuric acid industry; and even bronze pumps may show unexpected resistance under similar conditions.

Impurities in the acid and in the metals probably lead to the formation of protective films which are responsible for the good performance.

A very wide range of materials is nowadays available and may be used for the construction of pumps or pump linings. Some of the newer plastics seem very promising in their resistance to attack; but when linings are employed, the degrees of success achieved depends largely on the effectiveness with which the lining is bonded to the metal body, and this is frequently dependent on the individual skill of the craftsman applying the lining. This is particularly true of rubber lining.

Corrosion Factor

Stoneware or vitreous linings have been used with considerable success. Such linings are resistant to the attack of most liquid chemicals, but they are sensitive to mechanical or thermal shock, and the stuffing box problem is difficult to deal with.

To meet very extreme problems of potential corrosion, fabrication of the complete pumps in carbon or borosilicate glass has been resorted to.

The rate of corrosion is normally increased by rise of temperature; but the factor of increase is sometimes so striking as to exert a controlling influence on the conditions under which a particular material may be employed. For instance, in one series of tests the rate of attack of Hastelloy "B" by 25 per cent hydrochloric acid was increased 20 times by raising the temperature from 70°C. to 135°C.; and 37 times with 35 per cent hydrochloric acid over the same temperature range (*Metallurgia*, Vol. 40, 1949).

Other influences, such as the operating pressure or the presence of free gases, introduce additional complications impossible to assess excepting on the basis of experience.

Where resistance to corrosion depends on the formation of a protective film, the rate of attack may be multiplied enormously by attrition. The use of soft resilient rubber as a liner is frequently found advantageous on this account when abrasive matter is present.

Resistance to Attrition

The effect of attrition may be modified by the design of the pump. It is well known, for instance, that a centrifugal pump handling a chemical magma or similar product must have smooth surfaces free from interruption where in contact with the product. Any disturbance to smooth flow, however minute, may start the formation of eddy currents and lead to rapid attrition.

As an illustration of this effect, the author may cite an experience with a chemical magma pump. This pump was provided with a renewable wearing plate, of robust construction, which was secured by four countersunk head bolts of the same material as the wearing plate itself.

After fitting in the pump casing, the bolt heads were ground flush with the wearing plate, and the surface practically polished, so that the bolt heads could hardly be detected by direct observation.

After operating on the chemical magma for a period of a few weeks, the pump was examined. It was found that the minute break in continuity of surface at each of the bolt heads had been enough to start a trail of attrition, taking the form of deep grooves cut into the metal wearing plate surface.

In the search for internal surfaces free from any such disturbance, it will frequently be found that even pressure gauge, priming and drain connections may have to be omitted.

* Abstracted from a paper delivered to the North Western Branch of the Institution of Chemical Engineers, Manchester on Saturday, February 18.

One of the most unsuitable types of centrifugal pump for this type of chemical work is the horizontally split casing design. The presence of the casing joint at right-angles to flow, can create a disturbance to smooth flow that may become the starting point for rapid combined erosion and corrosion.

In addition to the problems of corrosion and erosion to be met in the chemical industry, many other difficulties arise, often unexpectedly. For instance, the generation of static electrical charges, due to high velocity flow of liquid through a pipeline, valve or nozzle, is a far from infrequent occurrence.

Indeed, serious fires have been caused in this manner when dealing with inflammable liquids. It is particularly important to avoid any possibility of the generation of electrostatic charge when delivering an inflammable liquid to atmosphere through a nozzle.

For this reason, it may be wise to limit the pipeline and nozzle discharge velocity to 12 ft./sec., and to make provision for suitable earthing of pumps and pipelines.

The most successful centrifugal pumps for chemical work are frequently those with the simplest design features. They must be robust in design, and internal parts should be easily replaceable. Centrifugal pumps for chemical work may be either of the horizontal type, embodying a stuffing box, or of the vertical type which can be designed as glandless pumps.

The need for unchokeable pumps frequently arises in the chemical industry and on occasion such pumps may also be used from considerations of proportional effect of wear and tear.

Stoneware and vitreous linings of pumps are chemically resistant to practically all acids with the exception of hydrofluoric. They are also resistant to almost all alkaline products and have reasonably high resistance to abrasion.

A reasonably low temperature at the stuffing box, which is the weakest point in the design of all types of acid pumps, and avoidance of rapid changes in temperature, particularly at the stuffing box, are of major importance.

In the chemical industry many other pumping problems arise, quite apart from the obvious one of handling chemically active acids, alkaline products, or salt and magma solutions.

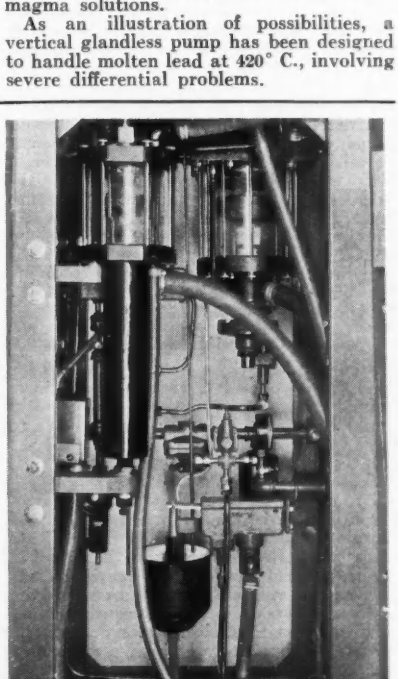
As an illustration of possibilities, a vertical glandless pump has been designed to handle molten lead at 420° C., involving severe differential problems.

WATER STERILISATION

Use of Plastics and Rare Metals

SILVER, tantalum, tungsten, platinum, iridium, columbium and, in fact, most of the noble metals, are finding increasingly numerous useful application for fabricating certain components of the water chlorinating plants. Typical of the marked advances which are being made in securing a high degree of corrosion resistance of vital components subject to continuous attack by chlorine and the mineral elements of normal water supplies are some installations being produced by Wallace & Tiernan, Ltd., London. Some of the fluorinated plastics are also being used for some vital parts, and research in this connection is continually being carried on.

The wide field in which the process of water sterilisation and bacteria control is effectively applied includes, in addition to the purification of drinking water, paper making and food canning. The chlorinator illustrated has been developed to meet the need for high capacity units for water supply and sewage disposal, etc. Capable of injecting 3000 lb. of chlorine in 24 hours, it employs automatic on/off and rate controls, all of which are protected from contact with the gas.



The Chemist's Bookshelf

CHEMICAL ENGINEERING PLANT DESIGN. F. C. Vilbrandt. McGraw Hill, 1949. 3rd Ed. Pp. x + 608. 51s.

The anxieties recently expressed by successive presidents of the Institution of Chemical Engineers are made more understandable when one sees the constant stream of American books in this field. Both Mr. Hugh Griffiths and Mr. Cremer have pointed to the urgent need that top-level (and other) British chemical engineers should prepare text-books specially suited for our own peculiar conditions. While science is international, technology has rather more of a national flavour because it is conditioned by such matters as availability of metals, symbols used, pipe and valve standard sizes—and like matters which vary a little from country to country. The latest edition of a most valuable compilation by Vilbrandt emphasises the point. It is generously equipped with tables, diagrams, conversion tables and copious references to literature, but the Standards, most of the references, sources of raw materials and even the gallon used are naturally those applying to the country for which it was written.

The principal feature of the new edition is a thoroughgoing revision of the chapter on preconstruction cost estimation. But the sources are not all readily available to British workers. Arrangement of chapters remains as before. It is still a little puzzling to know why such a basic subject as "Development of the Design Project" is pushed back to Chapter VIII in a total of 13 chapters. Intrinsically, however, the book fulfils what it sets out to do—to give guidance and assistance to the engineer engaged in chemical engineering plant design. Equipment design as such is not discussed.

Starting solidly on the subject of "Foundations," Vilbrandt works through installation problems, through the development of the design project, layout and location and deals in a final chapter with cost estimating. A useful appendix is a set of major project problems for students.—I.B.

CHEMISTRY AND TECHNOLOGY OF WINES AND LIQUORS. By Karl M. Herstein and Morris B. Jacobs. London: Macmillan. 2nd Ed. Pp. 436. 36s.

The authors of this book are a consulting chemist in New York City and the senior chemist in the Bureau of Food and Drugs, Department of Health, of the same city. The first edition appeared in 1935 and in recent years there have been many advances, both scientific and technological, which have necessitated the revision of most chapters.

The scope of the book includes a general review of the art of preparing alcoholic beverages from a historical aspect and the material in these sections, therefore, is far ranging in character. The chapters dealing with distilled liquors, on the other hand, particularly the one in liqueurs, contain much valuable detailed information, including a selection of typical formulae for various products.

Further evidence of detailed information is to be found in the section on analysis of liquors. The majority of the methods given are taken from the Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists (6th ed., 1945). An important feature is the inclusion of a large number of tables throughout the text and these are supplemented by a selection of analytical reference tables at the end of the book.

For those unfamiliar with the principles of fermentation, the first four chapters are devoted to theoretical considerations of sugars, enzymes and the chemistry of fermentation. There are two chapters on yeast and one each on malt and distillation, as well as information on whisky manufacture, ageing and blending. A section on brandy, rum and gin, and a chapter on wine covers the remaining ground.

For those connected with the wine and spirit trade this book will prove most valuable and others will find much to interest them.

Technical Publications

PROPERTIES, uses and specifications of a wide range of chemicals are given in condensed form in the revised edition of "Modern Solvents and Chemicals" now available from General Metallurgical and Chemical, Ltd., London and Manchester. There are five new chapters on polyethylene glycols, hydroxyethyl cellulose, plasticisers, acetals and sulphur compounds, tables of physical properties and a useful applications index. The book has in a limited degree the merits of a dictionary of chemicals and their uses, and so will no doubt find a permanent place in many chemical industrial bookshelves.

* * *

CHARTS of liquid-vapour equilibrium constants (two volumes) and fugacities for light hydrocarbons in mixtures (one volume) have just been issued by The M. W. Kellog Co., refinery and chemical engineers of Jersey City, New Jersey, U.S.A. The graphs are not only functions of temperature and pressure but also of the composition of both liquid and vapour phases. Pressures graduated from atmospheric to 1000 p.s.i. are covered for any mixture of hydrocarbons from methane to n-heptane, including unsaturates. Instructions and sample calculations are included for bubble points, dew points and equilibrium flash points.

* * *

AN ingenius slide rule for spot welding of mild steel is now available from the British Welding Research Association. The rule automatically supplies at a glance minimum electrode pressure, edge distance, tip diameter, material thickness, weld time and weld current.

* * *

INDUSTRIAL applications of radioisotopes and their employment in tracer and control work are described in "Radioisotopes . . . a Survey," now available from The Kellex Corporation, Broadway, New York City, U.S.A. The booklet opens with a simple explanation of what isotopes are, the difference between stable and radioisotopes and their properties, which enables the reader to understand better the rapid developments being made in this new form of industrial technique.

* * *

MUCH of the special equipment employed in the U.S. Bureau of Mines' coal-hydrogenation demonstration plant at Louisiana, Missouri, is now reviewed in a 40-page illustrated booklet which also describes the process. Among the particular items discussed are high-pressure vessels, converters, pre-heaters, heat exchangers, hydrogen and nitrogen production and compression, pumps, high-pressure tubing, flanges, fittings and valves, and low-pressure auxiliary operations. "Special Equipment in the Coal Hydrogenation Demonstration Plant" (No. 4584) is obtainable from the publications distribution section, U.S. Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.

* * *

IN March, 1900, Wilfred E. Redfern, a young man with £4 18s. 1d. capital and much optimism, decided to set up in business. To mark its 50th year in the rubber industry, Redfern's Rubber Works, Ltd., Hyde, Cheshire, has issued a pamphlet tracing the firm's achievements in peace and war during an eventful half century.

* * *

VISUAL aids is a term that has come to include a wide variety of scientific equipment. In its new catalogue just issued W. & J. George & Becker, Ltd., London, give a comprehensive list of such apparatus under the five main headings diascopes, film strip projectors, episcopes epidiascopes, and micro-projectors.

* * *

A USEFUL compilation of basic facts about polythene, resistance to attack, etc., is offered in a new catalogue now available from Rediweld, Ltd., Wandsworth, London, S.W. Other pamphlets deal with polythene safety jugs for handling acids and corrosive liquids, and Redivin PVC filter cloth.

* * *

IN response to inquiries regarding tests and analyses of minerals and related inorganic materials the U.S. Bureau of Mines has listed (in Information Circular 7523) laboratories prepared to carry out special testing services in addition to ordinary assays and chemical analyses, more particularly for the evaluation of mineral resources. The text has been rewritten by Bertha R. Khahold (librarian, Bureau of Mines) from the original circular "Laboratories that Make Fire Assays, Analyses, and Tests on Ores, Minerals, Metals and other Inorganic Substances," by C. W. Davis and M. W. Bernewitz, first published in 1938 and revised the following year. Descriptions of testing techniques are given.

HOME

Opposition to Cement Works

Vigorous opposition to the proposed establishment of a large cement works at Lydstep, on the Pembrokeshire coast, is to be raised by the executive committee of the Council for the Preservation of Rural Wales. The setting up of the works would be accompanied by the quarrying for limestone of 500 acres within one mile of National Trust property.

£3 Million More Textiles

The market value of textiles to be produced at the new factory of Courtaulds, Ltd., Carrickfergus, the most up-to-date rayon plant in the country, when in full production, would be about £3 million a year, said Mr. R. Garnsey, the local manager, in Belfast last week. The factory will go into production in four or five weeks' time and should be in full production in about a year. It will employ ultimately about 1600 workers.

Refinery's Massive Cooling Tower

The cooling tower now under construction at the new £20 million refinery for Middle East Oil at Stanlow, Ellesmere Port, will be the biggest and the highest in the world. With a diameter of 260 feet, it will rise to 340 feet, just two feet below the height of Liverpool Cathedral central tower, and exceeding by 30 feet the height of the present highest tower at Birmingham. The capacity of the present tower is 1.7 million gals. an hour; the new one will cool between three and four times as much.

Shortage of High Grade Silica

A public inquiry was held at Wrexham last week into an application by Bwlchgwyn Silica Company, Ltd., to extend local quarrying operations to an extent which might involve the removal of Bwlchgwyn village, with its 800 inhabitants, in future years. Dr. W. Davies, geological consultant to the company, said that the silica in the area was pure and high grade, and of the type that could be found only in one other place in Britain. If supplies of the right grade of silica for refractory brickmaking could not be obtained steel production would be affected. After hearing objections to the proposals, Mr. S. T. Roberts, Ministry inspector, closed the inquiry. He later visited the site.

Fluoride Treatment for Teeth

More than 3000 school children in various parts of England are to take part —with the consent of their parents—in tests to prove the effectiveness of a solution of fluoride as a protection against dental decay.

OCCA Technical Exhibition

The Technical Trade Exhibition organised by the London section of the Oil and Colour Chemists' Association will be held at the Borough Polytechnic on Thursday and Friday, April 13 and 14, from 3-9 p.m. Some 25 firms will be taking part in the exhibition.

Week's Coal Production

Output of deep-mined coal in Great Britain last week was 4,108,300 tons, a reduction of 19,000 tons compared with the previous week; while opencast workings produced 7800 tons more than the previous week, with a total of 219,100 tons. Total production for the first nine weeks of this year was 38,648,400 tons, 581,400 tons more than in the same period of 1949.

Housing for Atomic Research

Mr. C. Hinton, deputy controller of atomic research, on March 6 cut the first sod on the Chester Rural Council housing site at Great Saughall, Wirral, which is to house employees of the Ministry of Supply atomic research centre at Capenhurst. The contract provides £58,770 for 44 houses. Nearby, at Little Saughall, 42 houses are to be built at a cost of £61,744.

Chemical Works May Move

At a meeting of the West Riding Rivers Board in Wakefield it was stated that the Wyke Chemical Works, owned by A. H. Marks and Co., Ltd., Wyke, Bradford, might be transferred to another part of the country. The matter arose out of an investigation of a complaint regarding alleged pollution at the factory and the Ministry of Health had informed the Rivers Board that the company had explored the possibilities of sites at nine different places in England and Scotland. Objection had been raised to the business being transferred to what appeared to them the only suitable site. These objections, the Ministry stated, were now the subject of discussion.

· PERSONAL ·

THE Willard Gibbs Medal in Chemistry, one of the highest honours in American science, has been awarded to PROF. CARL SHIPP MARVEL, of the University of Illinois, wartime leader in the synthetic rubber programme, and former president of the American Chemical Society. From 1944 to 1946 Prof. Marvel was chairman of the National Research Council's Panel on Synthesis of Antimalarial Drugs and one of the Board for Co-ordination of Malarial Studies.

DR. L. H. LAMPITT has been awarded the International Medal of the Society of Chemical Industry. The presentation will be made at a meeting of the society in London next month, when the doctor will deliver an address "Towards International Collaboration in Science."

DR. HERBERT W. SKINNER has been appointed temporarily head of the theoretical physics division of the Atomic Energy Establishment, Harwell, to fill the vacancy caused by the removal of Klaus Emil Julius Fuchs. Dr. Skinner, who is 49, is also head of the general physics division, and was in charge of the initial development at Harwell. Last July he was appointed to the Lyon Jones chair of physics at Liverpool University.

SIR LAURENCE MERRIAN has completed his examination of the controls in the Board of Trade and accordingly relinquishes his special appointment as Examiner of Controls. His recommendations, says the Board, have been put into effect as they have been made.

Officers appointed at the sixth annual general meeting of the microchemistry group of the Society of Public Analysts and Other Analytical Chemists were: MR. RONALD BELCHER, chairman; DR. CECIL L. WILSON, vice-chairman; MR. DONALD F. PHILLIPS, secretary; MR. GERALD INGRAM, treasurer; Messrs. A. E. HERON, R. F. MILTON, J. SANDILANDS, C. E. SPOONER, D. W. WILSON, G. H. WYATT, committee members.

The Privy Council has nominated DR. J. A. GILES, who was Chief Inspector under the Vivisection Acts, and DR. B. A. YOUNG, of St. Alfege's Hospital, Greenwich, to be members of the Council of the Pharmaceutical Society of Great Britain.

The vice-chancellor and syndicate of the University of Calcutta announce that the Sir Devaprasad Sarwadkikary Gold Medal for 1949 has been awarded to SIR EDWARD APPLETON, principal of the University of Edinburgh. The award, instituted in 1939, is made every two years. Last recipients were PROF. P. M. S. BLACKETT (1947) and PROF. ALBERT EINSTEIN (1945).

The Textile Institute is to award service medals to MR. HUGH JAMES DORMAN, secretary of the Belfast section from 1946 to 1949, MR. R. G. OVERSBY, secretary of the Yorkshire section since 1946, and MR. T. H. ROBINSON, a member of the Institute's council. The presentations will be made at the Institute's Royal charter celebration dinner in Bradford on March 14.

DR. J. E. HOLMSTROM, the author of the UNESCO report "Interlingual Scientific and Technical Dictionaries," is to present a paper in English on "Internationalisation of Subject Index Heads" to the British Esperantist Scientific Association, at University College, Gower Street, W.C.1, on March 14 at 7 p.m.

MR. ALEC WEBSTER, whose articles on the financial aspects of accident prevention have appeared in *Fire Protection*, has resigned his appointment of safety officer to the Association of British Chemical Manufacturers on establishing his own practice as an industrial safety consultant. He will specialise in all aspects of industrial safety, including the safe storage and handling of chemicals, disposal of waste products, chemical control, mechanical separation and related operations.

Newly appointed Regional Controller of the Board of Trade in Wales is CAPT. H. P. K. ORAM, R.N.(retd.). He takes up his duties on Monday next. His predecessor, MR. H. DAVIES, is now secretary of the Durham Divisional Board, National Coal Board.

OBITUARY

The death occurred suddenly, on February 28, of MR. J. E. NASH, a manager of Robert Jenkins & Co., Ltd., engineers, etc., Rotherham. Mr. Nash had been with the company since his apprenticeship there in 1908.

OVERSEAS

New Stainless Steel Alloy

A new metal alloy, Armco 17-7 PH stainless steel has been announced by the Armco Steel Corporation, Middletown, Connecticut. The new alloy is said to combine excellent corrosion resistance with high strength hardness and to have good fabricating properties.

U.S. Manganese Economy

U.S. steelmakers are supporting a Bureau of Mines research project to find a method of recovering manganese from steel furnace slag. About 13.3 lb. of manganese are used in making 1 ton of steel and in the first nine months of 1949 the U.S. imported over 1 million tons. The present reclamation project could make available 400,000 tons annually it is estimated.

U.S. Loss on Tin

The Reconstruction Finance Corporation in a report to the U.S. Congress announced that it had sustained a loss of $18.5 million on its tin inventories. The corporation attributed its loss to the devaluation of European currencies and the resumption of free trading in the metal in London and Singapore. The price of tin has dropped within the past year from $1.03 to 70.43 cents per lb.

Tin Output

World production of tin in December was 14,500 long tons, an increase of 300 tons on the November figure, reports the International Tin Study Group. World output of tin-in-concentrates and of tin metal was greater last year than in 1948 according to a recent bulletin of the International Tin Study Group. There was considerable expansion in Malaya, which again was the leading producer of both types of tin.

Monsanto's Phosphate Deposits

The Monsanto Chemical Company, St. Louis, U.S.A., has obtained an option to purchase part of the extensive phosphate deposits of the Humphreys Phosphate Company, of Denver, Colorado. The deposits are near Vernal, in the State of Utah. The chemical company is to carry out extensive prospecting here, as it is doing in Florida and other western areas. Material is required for the Monsanto, Tennessee, plant, where five electric arc furnaces produce elemental phosphorus, source of phosphoric acid, upon which many of Monsanto's 122 products depend.

Free Entry of Medicinal Chemicals

The effect of a recent Government decree in Peru has been to free essential medicines, pharmaceutical products and surgical supplies from all import duties and from certain other charges.

French Technical Aid for the U.S.A.

The Sté Chimique de la Grande Paroisse is reported to have concluded with the Mississippi Chemical Corporation a contract for supplying plans and technical assistance to construct an ammonia plant in the United States.

U.S. Zinc Mine Reopened

The reopening of its Kearney zinc mine, near Hanover, New Mexico, closed since June, 1949, is announced by the Illinois Zinc Company. Operations at the company's Deming concentrating plant, which treats ores from the Kearney mine, will also be resumed.

Israel Seeking Potash Control

The proposal in Israel to nationalise the Palestine Potash Co., Ltd., has been rejected by an Israeli Government committee. The committee is understood to have recommended that a controlling interest in the Dead Sea undertaking should be acquired for Israel and that the administration should be removed there from London.

German Assets for Sale

The option right for Fr.100,000 shares of Teerfaben AG, Zurich, at present held by I.G. Farben Industrie, AG, Frankfurt-am-Main, is to be sold by the Swiss Government. Teerfaben AG deals in dyestuffs and chemical products. Particulars of the sale may be obtained from the Swiss Compensation Office, Tabstrasse 62, Zurich.

Zinc Company's New Interest

An Australian company, Sulphide Corporation, Pty., has been formed to take over the Sulphide Corporation's cement, acid and fertiliser works at Cockle Street, New South Wales. The new company, whose present paid-up capital is £A.750,000, is a subsidiary of the Consolidated Zinc Corporation. It will, besides continuing normal operations, carry out research on the production and use of sulphuric acid and processes in the production of refined zinc from zinc concentrates.

Next Week's Events

MONDAY, MARCH 13

Society of Instrument Technology

Manchester: College of Technology, 7.30 p.m. Dr. R. C. Parker: "Measurement of Surface Temperature."

Society of Chemical Industry

Leeds: University, 7 p.m. Prof. W. R. Atkin: "The Durability of Leather."

The Institute of Metals

Glasgow: 39 Elmbank Crescent, C.2, 6.30 p.m. (Scottish Section) A.G.M. G. H. Botham: "Uses of Non-Ferrous Metals in the Chemical and Food Industry."

TUESDAY, MARCH 14

Society of Chemical Industry

London: 26 Portland Place, W.1, 6.30 p.m. A. R. Burgess and G. L. Hammond: "Degradation and Weathering of Plastics and Rubbers."

Institution of Chemical Engineers

London: Burlington House, Piccadilly, W.1, 5.30 p.m. Research papers from Imperial and University colleges, London.

Incorporated Plant Engineers

Manchester: Engineers' Club, 7.15 p.m. H.M. Inspector of Factories: "Safety Requirements for Electrical Installations within the Scope of the Factory Act."

Royal Institute of Chemistry

Stockport: Central Public Library, 6.30 p.m. J. H. Carrington: "Rubber."

Hull Chemical and Engineering Society

Hull: Church Institute, Albion Street, 7.30 p.m. D. E. Bellamy: "Electrolytic Copper Refining."

The Institute of Metals

Swansea: University College, Singleton Park, 6.30 p.m. (South Wales Section). F. C. Aschen: "Fuel Utilisation in the Non-ferrous Industry."

WEDNESDAY, MARCH 15

The Royal Institute of Chemistry

London: Royal Institution, 21 Albemarle Street, W.1, 6.30 p.m. Dr. J. Dewar: "The Functions of the Chemist in a Large Industrial Organisation."

Manchester Metallurgical Society

Manchester: Engineers' Club, 6.30 p.m. (with Institute of Metals). Dr. U. R. Evans: "Modern Views of the Corrosion of Metals."

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, Adelphi, W.C.2, 7 p.m. "The Use of Compressed Air in Industry."

Bristol: Grand Hotel, 7.15 p.m. (Western Branch). Annual general meeting. E. C. Mills: "Power Factor Correction."

THURSDAY, MARCH 16

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.15 p.m. D. H. Derbyshire and W. A. Waters: "The Significance of the Bromine Cation in Aromatic Substitution"—Parts I and II; and other papers.

Liverpool: University, 4.30 p.m. Prof. M. G. Evans: "Photo-excited Electron-transfer Reactions." Prof. E. K. Rideal: "Heterogeneous Catalysis."

Sheffield: University, 5.30 p.m. Prof. E. R. H. Jones: "Recent Developments in Acetylene Chemistry."

Edinburgh: North British Station Hotel, 7.30 p.m. (with RIC and SCI). Dr. M. Ritchie: "Some Aspects of Photo-oxidation with Reference to Chlorophyll."

The Royal Society

London: Burlington House, Piccadilly, W.1, 11 a.m. Discussion: "The Measurement of Growth and Form." 4.15 p.m. Election of fellows.

The Institute of Physics

Birmingham: University, Edgbaston, 5 p.m. (Midland Branch). Prof. N. F. Mott: "Some Advances in the Theory of Creep in Metals."

FRIDAY, MARCH 17

The Chemical Society

Birmingham: University, Edgbaston, 4.30 p.m. Prof. E. K. Rideal: "How Crystals Grow."

The Institute of Physics

London: 32 Welbeck Street, W.1, 6.30 p.m. (Electronics Group, with British Institute of Radiology): "The Biological Effects of Non-Ionising Radiations with Particular Reference to Microwaves."

Society of Public Analysts and Other Analytical Chemists

London: Royal Society, Burlington House, Piccadilly, W.1, 4.30 p.m. Annual general meeting and election of officers, followed by The Bernard Dyer Memorial Lecture by Sir John Russell.

SATURDAY, MARCH 18

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. Dr. M. Ruhemann: "The Production of Technical Argon."

Birmingham: Prof. F. H. Garner: "Liquid-Liquid Mixing."

RECONSTRUCTION IN ITALY

Production Has Surpassed the Pre-War Level

POST-WAR reconstruction of Italian chemical industry, although initially rather slow, was accelerated in 1947-48, and by the beginning of 1949 was nearing completion.

The increasing activity in the industry is reflected by the chemicals production index (pre-war 100) which was 46.6 in 1946, 74.2 in 1947, about 80 in 1948, and for the first half of 1949, averaged 87. In June and July, 1949, it was, in fact, just over 100 (102.5) and has since continued to rise. These figures represent average or total indices for the three groups: basic chemicals, chemical products for agriculture, and chemical products for industry. For July, 1949, these were respectively: 122.4, 107.4, and 82.6.

Distribution of Chemicals

Although no exact figures are available, it may be stated that some 20 per cent of Italian chemical output is for agriculture, 30 per cent for general consumption, and 50 per cent for industrial needs.

The above estimate is derived from a report by Dr. Sanvisenti, of Milan (*Chemische Ind.*, 1950, *2*, 17-19) and supplements the review of Italian chemical industry given by Luigi Morandi last year to the Lombardy section of the Italian Chemical Society.

Since the war Italian chemical exports have risen substantially. This applies in a marked degree to sulphuric acid, alkalis, and superphosphate, although some other important items, such as copper sulphate, citric and tartaric acids, and alumina, have not made such a good recovery. Copper sulphate, in fact, is now one of the most vital imports.

	Exports in tons			
	1938	1947	1948	1949 Jan.-June
HEAVY CHEMICALS				
(Total)	94,429	39,123	156,238	41,727
Alumina (dry) ...	39,616	10,808	22,019	6,509
Sulphuric acid ...	684	4,851	9,383	7,087
Caustic soda ...	2,817	2,787	75,824	6,267
Soda ash	3,123	46	19,832	3,023
Copper sulphate	8,517	55	0.2	—
Lithopone ...	1,890	172	1,649	995
FERTILISERS (Total)	5,405	1,035	124,254	124,419
Superphosphate ...	3,317	1,011	84,617	99,983
Ammonium sulphate	432	1	26,569	20,661
ORGANIC CHEMICALS				
(Total)	16,600	9,806	13,507	7,648
Citric acid ...	2,486	224	708	76
Tartaric acid ...	2,003	1,429	939	889
Carbon disulphide	1,403	513	480	550
Phthalic anhydride	0.5	70	198	126

Exports of sulphur will be greatly augmented by the recently signed agreement between Italy, Australia and New Zealand, by which Italy is to supply 150,000 tons of sulphur by July 31, 1950. Total exports in 1948 were 76,096 tons, and, in January to September, 1949, 54,789 tons, France being the principal consumer.

The import figures are comparatively small. Inorganic chemicals imported during the first half of 1949 amounted to 23,141.4 tons, of which $CuSO_4$ was 10,084.6 tons. Fertilisers were 38,577 tons, and organic chemicals 13,076.1 tons.

High hopes and ambitious plans for the future are based on the fuller working of the Marshall Plan and other aid to increase production. For developing such fundamentally important products as nitrogen and phosphorus fertilisers, alkalis and copper sulphate, investments up to $63 million are being made. Large extensions will be made also in the plastics and other branches of chemical industry. Estimated production indices (1938 = 100) are as follows:—

	1948-9	1952-3
Nitrogen fertilisers	110	154
Phosphorus fertilisers	130	147
Copper sulphate	63	127
Sulphuric acid	95	140
Soda ash	105	140
Caustic soda	110	126
Dyes, etc.	110	120
Synthetic resins	110	145
Employed persons	100	132

Attainment of the 1952-53 index would mean that the number of employed would be increased to 170,000, distributed (per 1000) roughly as follows: fertilisers 23; coal products 17; petroleum refining and chemicals 15; alcohol 5; dyes 8; paints, etc., 8; drugs, cosmetics, perfumes 22; soaps, glycerin, etc., 14; other industries 58.

By 1952 sulphuric acid production should reach 1.4 million tons, which would be used mainly in the home industries (fertilisers, textiles, etc.). In the field of alkalis, present capacities, per annum, are: soda ash 210,000 tons, caustic soda 170,000 tons, and electrolytic soda 85,000 tons. Calcium carbide production will also be greatly increased. In the fertilisers industry, phosphate output should be increased to 340,000 tons in 1952-3, mostly for home use; and production of nitrogenous ferti-

(continued at foot of next page)

German Mineral Pigment Industry

Better Materials Supplies Have Helped Recovery

THE average turnover during three pre-war years (1936-38) of the German mineral pigment industry, including carbon black, printing ink pigments, and those used in the ceramic, textile and other industries, amounted to Rm. 200 million, of which 28 per cent was export trade.* Although it suffered heavily during the war, it has shown greater power of recovery than some other industries, partly because certain sources of important raw materials are indigenous. It it true that the loss of Polish—and Russian—occupied districts has considerably reduced the home market, yet it has not greatly affected productive capacity.

Replacing Plant and Materials

The two chief problems immediately after the war were the reconstruction of damaged or destroyed factories and procuring supplies of raw materials not available in Germany. The latter included many metallic compounds, *e.g.*, of lead, zinc, cadmium, antimony, selenium, chromium, boron; also resins and drying oils.

The practical elimination of the I. G. Farbenindustrie, the principal supplier of intermediates and organic pigments, was a further serious loss. Since the currency and exchange reform conditions were improved, however, factories have been rebuilt and restored, and raw materials become more freely available.

The rate of recovery has necessarily varied in different sections of the industry. Suppliers of carbon black, etc., for the rubber manufacturers and of zinc oxide and zinc white, who appeared to be making a fairly quick recovery, experienced a set-back resulting from the demolition of the Buna factories and the importation of American tyres. New types of black are, however, being developed for rubber and for the paint industry.

In the enamels field there was an unexpectedly large demand for use in the porcelain factories. Compounds of lead and boron are said to be in sufficient supply, and increased demand for enamelled goods derives, partly at least, from the growing preference of the German housewife for these in place of aluminium vessels. Manufacturers of enamelled goods who previously made their own enamels are now coming to rely on specialised producers of the coating.

Owing to the separation of the Polish and Russian zones and of the Berlin zones, the market for lead compounds—litharge and red lead—has been deprived of some of its principal buyers. These included the manufacturers of accumulators, crystal glass and ceramics. The market is further limited by the high price of lead oxides and other compounds.

Prospects in the printing ink section are much more favourable, now that paper supplies are more adequate, and illustrated books and journals, including technical periodicals, can be published on a larger scale, with plentiful use of coloured illustrations.

There are interesting developments, too, in printing on plastic or other synthetic films and on various new textile materials, all of which will constitute a large and growing field for printing inks and for the different pigments required in their production. Further attempts are being made to formulate quick-drying inks, such as those which react well with infra-red rays.

* Representing a summary by Dr. Hans Bolte, published in *Chemische Industrie*, December 1949 (pp. 298-300).

RECONSTRUCTION IN ITALY

(*continued from previous page*)

lisers is planned to be 210,000 tons (in terms of N) of which about one-quarter would be for export. Copper sulphate output should reach 140,000 tons.

The plastics industry is relatively new in Italy. Present capacity, per annum, is 27,000 tons, of which phenol and cresol resins account for 12,000 tons and urea resins 6000 tons. By 1952-53 it is hoped to increase output to 32,000 tons, of which 2000 tons should be available for export.

In 1940 there were about 800 factories, mostly small, engaged in the manufacture of pharmaceuticals and cosmetics, and employing 20,000 workers. The industry is still largely in the hands of relatively small firms but there is an increasing number of local associates or branches of foreign companies. Sandoz S.p.A. (Milan), Geigy S.p.A. (Milan), and S.A.I. Laboratori Glaxo (Verona) are among the most important of these.

BARYTES MINING IN SCOTLAND

Good Prospects of Supplementing Dwindling Deposits

THE mining of barytes, one of Britain's most ancient mining industries, is of greatly increased importance to-day owing to the numerous uses of the mineral in modern chemical processes.

The danger, foreseen by the Mineral Development Committee, that if the 1947 output of barytes is maintained present workings may be exhausted within 10 to 20 years deserves some attention, and the need to discover supplementary supplies is more than ever important (THE CHEMICAL AGE, *61*, 137). Whether the Central Land Board, now responsible for the exploitation of privately owned land where mineral deposits are found to exist, will carry out its task more efficiently than have the owners remains a matter of conjecture.

Evidence that Scottish mining concerns have by no means been dilatory in the work of exploration in recent years is available in an article recently presented in *The South African Mining and Engineering Journal* (*60*, Part II, 631), abstracts of which are reproduced here.

Versatility

It recalls that the most common application for barytes is in the manufacture of lithopone, which accounts for more than half Britain's consumption. Barytes is also used extensively in the production of hydrogen peroxide and blanc-fixe. Other uses are in the manufacture of paints; as a filler in the manufacture of linoleum, rubber and asbestos goods; in the production of wallpaper, Bristol board, fertilisers, insecticides, soap, tiles, glazes, textiles, and various leathers. As a thickening agent barytes is used to increase the specific gravity of the washing fluid in the Barvois process of coal-washing.

As a shield against X-rays barytes is mixed with rubber to form X-ray tube casings, or with plaster for application to the walls and ceilings of X-ray rooms.

Although the world's principal sources of barytes are the U.S.A. and Germany, large quantities are mined in the United Kingdom. Scotland, where 18,500 tons was produced in 1947, was responsible for nearly one-quarter of the total British output. One of the largest single producers in that country is the Gass Water mine near Muirkirk, Ayrshire.

The rich veins there have been known since before 1870 but were not opened up until 1917. The spar was wrought opencast and by stoping from an adit level, but the total amount raised in four years was only 7976 tons. Operations were started by the present lessees in 1923 and since that date the Gass Water mines have produced over 400,000 tons of barytes.

Four sub-parallel veins have been exploited and the workings extend intermittently for 1⅝ miles. Annual production of the mine has averaged about 19,000 tons over a long period.

Development Plans

At present some 40,000 tons of barytes are proved and blocked out, which is sufficient for two years at the current production rate. Normal development should enable the mine to continue in operation for at least five years, and prospects of a considerably longer life are regarded as reasonably good.

At the Muirshiels Mine, in Renfrewshire, mining for barytes is believed to have been more or less continuous from shortly after the middle of the 18th Century until 1920, though annual production was never very large. After lying idle for over 20 years the mine has been opened up again by new lessees, who have embarked upon an extensive programme of exploration and development.

The greatest width of barytes proved there so far is about 12½ ft., but pockets up to 30 ft. wide have occasionally been encountered.

After seven years, 40,000 tons of barytes have been raised and current production is just over 1000 tons a month. Proved reserves are said to amount to about 70,000 tons, with probable reserves of a further 50,000 tons.

For the past six years barytes has been stoped at a depth of 110 ft. Now a shaft has been sunk 200 ft. below the intermediate opencast and the level has been driven at this horizon for 200 ft. south and 700 ft. north in solid barytes all the way. This development is still going on, and, since the shaft at 200 ft. is still in barytes, it is proposed to sink it further.

Further exploration in a number of Scottish districts, in some of which mines have been worked previously, appears to offer promising prospects. In Kirkcudbright a small mine has lately been reopened and barytes is known to occur in at least three other counties.

The Stock and Chemical Markets

BUSINESS in all sections of stock markets has remained on a small scale owing to political uncertainties. The Government's programme, as outlined in the King's Speech, confirms that it is hoped to keep in abeyance major schemes for changes in industries, pending the next election.

Caution continues to characterise policy in the markets partly because the Budget, expected on April 18, will provide a test of strength. There appears to be a widespread belief that if the Government survives its Budget proposals, it may manage to remain in office until the Autumn. It may be possible to postpone a General Election until early next year.

The next few weeks should, however, provide a clear indication of the Government's attitude to such questions as dividend limitation and bonus share issues. The City believes there can be no question of legislation to make dividend limitation compulsory. It is pointed out that although earnings of the more efficient companies may improve, changing conditions in home and export markets, and growing competition and rising prices of raw materials mean that a wide range of companies have to face reduced profits in the future. In many cases the indications are that it will be difficult to maintain dividend payments.

Shares of chemical and allied companies have moved narrowly, apart from Imperial Chemical, which rose sharply to 42s. 3d., on news of the company's important American offer. The transaction would be financed by bank loans in New York and lead to a substantial increase in the flow of dollar earnings to the United Kingdom. The deal would mean that I.C.I. will have a medium whereby its own dyestuffs and other synthetic chemical products could be readily marketed in the U.S.A.

Monsanto Chemical 5s. shares showed firmness at 50s. 9d., Albright & Wilson were 28s. 9d., Boake Roberts 25s. 6d., Brotherton 19s. 3d., and F. W. Berk 14s. 3d. Amber Chemical 2s. shares were 4s. 9d., and Pest Control 5s. shares were 7s. 10½d. Fisons, at 23s. 3d. kept steadier, awaiting official news of the company's new capital plans. British Glues 4s. shares were 20s., at which there is a yield of 4⅞ per cent on the basis of last year's 25 per cent dividend.

British Oxygen, at 94s. 6d., have been well maintained, awaiting the results due in a few weeks; the market is continuing to talk of a big new issue, possibly on bonus terms, to shareholders.

British Aluminium, at 41s., held their recent improvement, but Turner & Newall (77s.) and United Molasses (37s. 3d.) turned easier, and the 4s. units of the Distillers Co. were slightly lower at 17s.

Iron and steel shares were again mostly lower on balance, with United Steel 25s., Stewarts & Lloyds 52s. 3d., Colvilles 33s., Dorman Long 29s., Hadfields 26s. and Beardmore 40s. 6d. Elsewhere, Staveley were 77s. and United Glass Bottle Manufacturers 68s. 9d.

Triplex Glass eased slightly to 18s. 6d. and Tube Investments, at £5½, were also easier. Boots Drug changed hands around 47s. 9d. in the early part of the week. Glaxo Laboratories (45s.) were firmer and Borax Consolidated (53s. 9d.) have been well maintained.

Oil shares, after being firmer, became easier as a result of the news that further financing by the ECA of refinery expansion plans of British oil companies is being withheld.

Market Reports

QUIET and steady conditions are again reported from the many sections of the industrial chemical market, with new contract business on a moderate scale. Buyers are exercising prudence in the face of the uncertain economic position, but spot or nearby delivery transactions have been reasonably good and the flow of overseas inquiry has been maintained at a satisfactory level. Among the soda products there has been a good inquiry for sulphite of soda, nitrate of soda and chlorate of soda and available supplies of the potash compounds are finding a ready outlet. There have been no further price changes for white lead and red lead and a steady trade is passing in both materials. There is little of outstanding interest to report on the coal tar products market and the volume of trade both for home and export shows little improvement. There is a fair demand at keen rates for cresylic acid and the xylols are firm on a good demand.

MANCHESTER.—Firm price conditions have continued in almost all sections of the Manchester chemical market during the past week and a generally strong undertone is expected to continue. Home-trade deliveries of the leading heavy

(*continued at foot of next page*)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CLASSIC CHEMICALS LTD., Radcliffe. (M., 11/3/50.) February 1, £4945 14s. 1d. charge, to S. G. Dentith, Salford; charged on 11, 13 and 15 Bury Road, Radcliffe. *£200. Dec. 31, 1948.

EUCOS PRODUCTS, LTD., London, N.W., chemical manufacturers. (M., 11/3/50.) Feb. 11, £3000 debentures, part of a series already registered. *£6000. May 23, 1949.

Satisfaction

T. LUCAS & CO., LTD., Bristol, chemical manufacturers. (M.S., 11/3/50.) Satisfaction February 8, of charge registered January 30, 1936.

Increase of Capital

The following increase in registered capital has been announced: Anglo Chemical & Ore Co., Ltd., from £10,000 to £50,000.

New Registrations

Ballbrook Scientific Glass Blowing Co., Ltd.
Private company. (478,831). Capital £100. Directors: E. L. Silverstone, M. Miller, and G. Naisby. Reg. office: 11 Albert Square, Manchester, 2.

Harland & Co. (London), Ltd.
Private company. (478,847). Capital £100. Import and export merchants of chemicals, nitrates, minerals, etc. Directors: J. C. Harland and W. E. Harland. Reg. office: 23 Bedford Row, W.C.1.

Nelsons Acetate, Ltd.
Private company. (478,937). Capital £20,000. Makers of chemicals, chemical solutions, cellulose acetate, vitriol and bleaching and dyeing materials, etc. Directors: E. W. Stansbie, C. E. Bargh, C. E. Allpress, G. C. Westgarth. Solicitors: Smith & Smith, Burnley.

Lydbrook Chemical Company, Ltd.
Private company. (478,934). Capital, £200. Manufacturers of chemicals, charcoal, acids, anti-corrosives, oils, greases, etc. Directors: A. H. Churchouse, F. C. Goldsworthy. Reg. office: Castle Main, Parkend, Lydney, Glos.

Company News

Barbet, Ltd.
The head office of Barbet, Ltd., has moved from 46 Fredericks' Place, Old Jewry, E.C.2, to 175 Piccadilly, W.1. The company, which is the English house of the Société Barbet, has recently been reorganised. Its present directors are: Messrs. P. Barbet, M. V. Girard and C. H. Tanner. Barbet, Ltd., is engaged in the supply of distillation plant of French and of English manufacture.

Murex, Ltd.
An interim dividend on ordinary stock of 4 per cent, less tax, for the year ending April 30, 1950, has been declared by the Murex board. It will be payable on March 31.

Redfern's Rubber Works, Ltd.
Net profit for the year ended December 31, 1949, after provision for tax, was £38,316. Final dividends of 3¾ per cent on the "A" and "B" preference shares, and 5 per cent on ordinary shares plus a bonus of 5 per cent. were recommended. £20,252 was carried forward.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

chemicals under contract have been on a satisfactory scale and there has again been a fair amount of fresh inquiry from domestic consumers and shippers. A steady improvement is reported in several descriptions of fertilisers and new business has been fairly extensive. The demand for the tar products has been maintained at around its recent level.

GLASGOW.—The trend of the Scottish chemical market has been firmer, order books being well filled. In general, the delivery position is satisfactory and no price changes have been noted. The supply position of toluol and xylol, however, continues to be difficult.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Process for the manufacture of acetic anhydride.—Distillers Co., Ltd., A. Elce, H. M. Stanley, and K. W. H. Tuerck. Feb. 28 1947. 635,054.

Synthesis of hydrocarbons. — Phillips Petroleum Co. Aug. 28 1946. 635,219.

Manufacture of formaldehyde.—A. H. Stevens. (G. L. Cabot, Inc.). Aug. 28 1946. 635,220.

Process for producing carbides of tungsten and/or of molybdenum and their sintered alloys.—Soc. Le Carbone-Lorraine. Aug. 19 1946. 635,121.

Preparation of beta-acyloxy carboxylic acid compounds.—B. F. Goodrich Co. Sept. 3 1946. 635,347.

Beta-substituted carboxylic acid compounds and method of preparing same.—B. F. Goodrich Co. Sept. 4 1946. 635,348.

Adhesive cement compositions, composite structures employing said adhesive cement compositions and methods of making said adhesive cement compositions.—Minnesota Mining & Manufacturing Co. Dec. 17 1946. 635,130.

Method of production of synthetic material from starch or starch-containing substances.—D. Horsak. Jan. 15 1947. 635,274.

Method of producing antisera of high strength.—Ciba, Ltd. Feb. 5 1947. 635,234.

Compositions for combating noxious organisms and processes for the preparation thereof.—N.V. De Bataafsche Petroleum Maatschappij. Feb. 5 1947. 635,134.

Polymerisation of vinyl compounds.—De Trey Frères Soc. Anon., and P. Castan. Jan. 23 1948. 635,074.

Production of mono-chlor-alpha-chlorethyl-benzene.—Distillers Co., Ltd., and W. Webster. March 19 1948. 635,280.

Organic antimony compound and process of preparing same.—Sterling Drugs, Inc. April 24 1947. 635,367.

Compositions prepared from oil-modified alkyd resins.—British Thomson-Houston Co., Ltd. April 29 1947. 635,286.

Method of and apparatus for purifying liquid hydrocyanic acid.—American Cyanamid Co. May 6 1947. 635,288.

Means for separating liquid particles from gaseous fluids.—Babcock & Wilcox, Ltd. May 29 1947. 635,241.

Production of organic acids.—Carnegie Institute of Technology. June 27 1947. 635,088.

Preparation and use of agents for combating noxious organisms.—N.V. De Bataafsche Petroleum Maatschappij. May 30 1947. 635,085.

Polyvinyl acetals.—E. I. Du Pont de Nemours & Co. July 4 1947. 635,294.

Separation of isobutylene from hydrocarbon mixtures.—Standard Oil Development Co. July 8 1947. 635,150.

Manufacture of phenanthridine compounds.—Wellcome Foundation, Ltd., L. P. Walls, and N. Whittaker. July 6 1948. 635,152.

Separation of gaseous mixtures.—Koppers Co., Inc. July 29 1947. 635,298.

Process for producing detergents of the alkyl aromatic sulphonate type.—Universal Oil Products Co. Aug. 6 1947. 635,303.

Manufacture of anhydrous caustic potash.—I.C.I., Ltd., and A. G. M. Hedley. Dec. 10 1948. 635,175.

Manufacture of iron oxide colouring matters.—I.C.I., Ltd., P. J. Atkins, and J. B. Peel. Dec. 15 1948. 635,177.

Sodium bicarbonate.—I.C.I., Ltd., and E. Ellis. Feb. 25 1949. 635,393.

Device for producing chemical reactions in a flowing gas by means of high-frequency electrical-discharges.—W. W. Triggs. (Patelhold Patentverwertungs- & Elektro-Holding A.G.). Sept. 8 1944. 635,398.

Process for the manufacture of hydrocarbon polymers.—C. Arnold. (Standard Oil Development Co.). May 10 1946. 635,757.

Process for the manufacture of carbides of the refractory metals.—Régie Nationale des Usines Renault. July 26 1946. 635,972.

Process for the production of butylene glycol and acetyl methyl carbinol.—Usines De Melle. July 30 1946. 635,973.

Process and apparatus for making carbon black.—Phillips Petroleum Co. Aug. 26 1946. 635,898.

Dehydrogenation of alkyl aromatic compounds.—Koppers Co., Inc. Sept. 12 1946. 635,827.

Pipe stills for the continuous distillation of tar.—Newton, Chambers & Co., Ltd., H. C. Mann, and L. S. Brown. Oct. 15 1947. 635,982.

High molecular weight copolymers, more especially as lubricating oil additives.—C. Arnold. (Standard Oil Development Co.). Oct. 28 1946. 635,903.

Vinyl-resin synthetic rubber compositions and method of preparing same.—B. F. Goodrich Co. Oct. 30 1946. 635,986.

Preparation of catalysts and their use in the manufacture of gasoline.—Davison Chemical Corporation. Dec. 23 1946. 635,992.

Manufacture of siloxane resins.—Dow Corning Corporation. Jan. 21 1946. 635,994.

Preparation of a soluble form of riboflavin.—Merck & Co., Inc. Feb. 20 1947. 635,773.

Oxidation of solid carbonaceous materials.—C. Arnold. (Standard Oil Development Co.). March 31 1947. 636,033.

Production of industrial mixtures of carbon monoxide and hydrogen.—J. C. Arnold. (Standard Oil Development Co.). March 31 1947. 635,909.

Acrylonitrile.—American Cyanamid Co. April 10 1947. 636,034.

Process of producing diammonium phosphate and the product resulting therefrom.—Monsanto Chemical Co. April 11 1947. 636,035.

Manufacture of cyclo-alkadienes.—Standard Oil Development Co. April 15 1947. 635,910.

Synthetic resinous compositions.—General Aniline & Film Corporation. April 25 1946. 635,911.

Process for the partial depolymerisation of polymerised methyl methacrylate.—Soc. Générale de Constructions Electriques et Mécaniques (Alsthom). May 17 1947. 635,912.

Production of synthesis gas mixtures containing carbon monoxide and hydrogen.—Standard Oil Development Co. Sept. 27 1946. 635,913.

Production of crystalline magnesium hydroxide.—W. C. Gilpin. June 2 1948. 635,781.

Electrodeposition of metals or alloys.—Udylite Corporation. June 24 1947. 636,050.

Copolymers of acrylonitrile with lesser amounts of conjugated dienes.—B. F. Goodrich Co. July 23 1947. 636,055.

Methods of humidifying air.—W. W. Cummings, Jun. July 25 1947. 636,056.

Preparation of organo-silicon resins.—M. Todd, C. Shaw, and W. E. Langrish-Smith. July 21 1948. 635,927.

Insecticidal compositions.—Harvel Corporation. July 30 1947. 635,846.

Polymerisation of butadiene-1, 3 hydrocarbons.—B. F. Goodrich Co. July 21 1947. 635,787.

Process for the production of di- and trichloracetaldehydes and acetals thereof.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 20 1947. 635,789.

Production of ketones.—United States Rubber Co. Aug. 18 1947. 635,934.

Process for preparing anisole.—E. I. Du Pont de Nemours & Co. Sept. 27 1947. 635,853.

Process for the recovery of hydrocarbon-substituted ammonium nitrites and the like.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 16 1947. 636,073.

Impregnation of porous articles with carbon.—C.D. Patents, Ltd., C. D. Greaves, and W. D. C. Walker. Nov. 22 1948. 635,796.

Cyanalkyl ether plasticisers and synthetic resin compositions plasticised therewith.—Distillers Co., Ltd., and D. Faulkner. Dec. 14 1948. 635,866.

Synthetic resin.—E. H. G. Sargent. Dec. 20 1948. 635,798.

Process for the production of 2-(*p*-amino - benzene-sulphonyl-amino)-pyrimidines.—Cilag, Ltd. Feb. 23 1948. 635,876.

Magnetrons.—British Thomson-Houston Co., Ltd. Sept. 10 1945. 635,479.

Method of preparing lubricating oils.—Compagnie Française de Raffinage. July 3 1946. 635,689.

Production of fluoboric acid.—Aluminum Co. of America. Aug. 8 1946. 635,551.

Production of aluminium-ammonium fluoride.—Aluminum Co. of America. Aug. 8 1946. 635,552.

Production of aluminium fluoride from aluminium-ammonium fluoride.—Aluminum Co. of America. Aug. 8 1945. 635,553.

Process for manufacturing phosphorus products and alumina and eventually hydraulic cements.—J. S. Seailles. Aug 28 1946. 635,612.

Thixotropic gel systems.—Sharp & Dohme, Inc. Oct. 8 1946. 635,559.

Apparatus for carbonating milk and other liquids.—E. Potter. (F. Lee.) Oct. 10 1946 635,560.

Methods of making organic hydroxy esters and the organic hydroxy esters resulting therefrom and the compounded lubricants including the organic hydroxy esters.—Monsanto Chemical Co. Feb. 5 1947. 635,708.

Process for producing hydrogen.—Universal Oil Products Co. March 3 1947. 635,493.

Process for refining vegetable and animal oils.—A/B Separator. March 20 1947. 635,571.

Manufacture of polymers of propylene.—C. Arnold. (Standard Oil Development Co.). April 18 1947. 635,576.

Process for separating sterols from oil concentrates.—Distillation Products, Inc. May 1 1947. 635,497.

Breaking water in oil emulsions.—W. Killner, A. S. C. Lawrence, and D. C. Ford. June 9 1948. 635,717.

RUST REMOVAL

New Brush or Immersion Treatment

A GENERAL purpose and economical rust removing material, which can also be used for the removal of corrosion products from aluminium and its alloys, has been recently introduced by the metal finishing division of The Pyrene Co., Ltd., Brentford, Middlesex. The makers claim that Preperite, as the new product is called, can be used either as a brush-on material or made up for the treatment of parts by immersion in a tank.

As an immersion solution an important feature claimed is that it does not need to be discarded at regular intervals and replaced by a freshly made up solution, but will continue in service indefinitely, provided that it is maintained by replenishment of the chemical as necessary. Additions required are determined by means of a simple chemical test.

Another feature of the solution is that it can be used cold or heated to any temperature up to 140° F., the warmed solution having the advantage of speed.

When used for the removal of rust, a prior degreasing operation is necessary in most cases. Degreasing can be carried out by any suitable method such as solvent wiping.

An immersion solution is made up to a concentration of one part of Preperite to two parts of water for use either cold or hot. The tanks required to hold the solution, in the case of a permanent installation, should be lined either with lead or rubber, but tanks of suitable glazed earthenware can also be used.

Following treatment by immersion, work may be rinsed, by hot or cold immersion, by hosing or any other suitable method.

When applied by brushing, dilute with tap water to a concentration of two parts of Preperite to one part of water. In all normal circumstances, a 5-minute application should be sufficient to remove the rust, after which the metal surface may be rinsed off with either hot or cold water.

Methods by which the new product can be applied to aluminium and its alloys are similar to those used for steel. Concentrations of the solution will, in most cases, be the same, but greater dilutions may be possible.

On aluminium surfaces it is claimed that an etch is left which is beneficial for paint bonding.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

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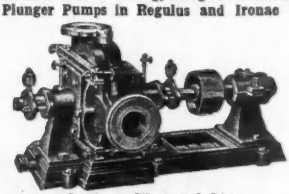

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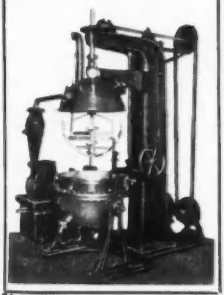

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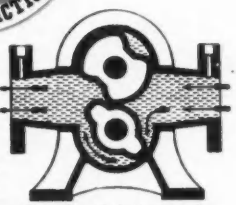

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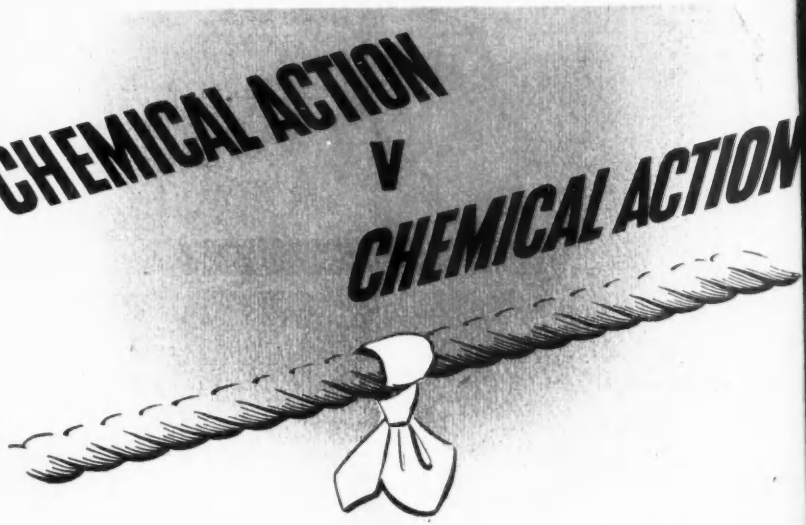

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